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NEARLY THREE AND A HALF MILLIONS.

VALUE OF ORDERS FOR SEVENTEEN STEEL FREIGHT CARRIERS ALREADY BOOKED FOR NEXT YEAR BY THE CONSOLIDATED SHIP YARDS OF THE GREAT LAKES.

About $3,390,000 is involved in orders for seventeen steel freighters already booked by the American Ship Building Co. for delivery next spring. This does not include any of the vessels now nearing completion and intended for service this year. Neither does it include the four vessels of Canadian canal dimensions, two steamers and two barges, which are to be finished before the close of navigation this year, and which are being built in the name of A. B. Wolvin of Duluth for a syndicate composed largely of stockholders of the American Ship Building Co. It is now more than probable that the consolidated ship yards of the lakes will have almost as many new vessels under construction during the coming winter as they had in the past winter. The best proof of this opinion is the number of orders already placed, and the fact also that negotiations now under way will add to the list a contract for another steamer, and possibly three, within the next few days. Vice-President Robert L. Ireland of the American company, who has been most active in the dealings with Cleveland owners, succeeded in increasing the J. C. Gilchrist order from five to six steamers. The sixth vessel will be the same as the others, of about 5,000 gross tons capacity and costing about $210,000. Alike to the other steamers, she will also have triple expansion engines and Scotch boilers, the latter fitted with the Howden system of hot draft. The most important order of the past week comes from D. R. Hanna of M. A. Hanna & Co., who is organizing a vessel company on the strength of an arrangement with the Calumet & Hecla Mining Co. for the transportation of its copper and for the movement of coal to the Portage district. The order from Mr. Hanna is for four steel vessels, two steamers and two barges, each of about 4,000 gross tons capacity. The steamers will be of 314 ft. keel, 42 ft. beam and 26 ft. depth. They will have triple expansion engines and steam will be supplied by Scotch boilers. The schooners will be of about 300 ft. length and their general dimensions will be about the same as the schooner Tyrone, which was built some time ago at the old Globe yard, Cleveland. Stockholders in the new company with Mr. Hanna will be largely Cleveland people. On trips down the lakes the steamers will usually carry copper from the Portage district, while the barges will take ore from Marquette. There is, of course, quite a large movement of coal to the copper country that is available for vessels of this kind. The vessels will be named for officials of the Calumet & Hecla Mining Co. and the Republic Iron & Steel Co. The steamers will be T. L. Livermore and R. A. Warner, and the schooners George A. Flagg and A. W. Thompson. The Livermore will tow the Flagg, representing the Calumet & Hecla Co., and the Warner and Thompson, named for officials of the Republic company will make up the second tow.

The announcement from Chicago that a contract has just been secured for four steel steamers of Canadian canal dimensions to ply in the Atlantic coasting trade, bears out President Brown's predictions of several months ago that the lake yards were quite certain of securing considerable business of this kind. There is no information as yet regarding the owners of these vessels, except that eastern grain dealers are to be interested in them. It is said that Chas. Counselman of Chicago is a prime mover in the new organization, and that the name will probably be Northwestern Transportation Co. The steamers will be built during the winter at South Chicago and will be ready for delivery to their owners on salt water with the opening of navigation next spring. The boats will be duplicates and will be designed for the carrying of package freight. They will be given three gangways on each side and will have steel main decks. Their machinery equipment will consist of triple expansion engines with Scotch boilers, and in all details the plans will comprise everything up to date. The cost of each boat will be $200,000, or a total of $800,000 for the entire order. Machinery will be placed in the stern, with pilot house well forward, as is the general practice with lake vessels. The builders are confident that they can follow this plan for ocean service without impairing the value of the ships from a structural standpoint, and have no fear of their ability to secure insurance on such vessels. The gangways will also be something of an innovation for the coasting trade, as ocean steamers have their cargoes hoisted through hatches in the deck as a general practice. President Brown has given the conditions of navigation on the Atlantic a great deal of careful study, and the combination of advantageous ideas in the design in both types of ships is believed by vesselmen to have produced the very best kind of a cargo ship for coastwise navigation. With the four Wolvin vessels to be finished this fall, the American Ship Building Co. now has under way eight freighters that are intended for Atlantic coast trade.

With the yards of the American Ship Building Co. filling up for the winter, it is expected, of course, that the lake builders operating independent of the consolidation will also be provided with about all the work they can care for. The Jenks Ship Building Co. of Port Huron has already decided to put down a steel steamer of Canadian canal dimensions on yard account if a contract for other work is not secured. At the works of the Craig Ship Building Co., Toledo, a steel steamer for Atlantic coast service is being finished up for J. L. Crosthwaite of Buffalo, who represents large southern lumber interests, and at this yard also a steamer of Welland canal dimensions is to be built for the Hawgoods of Cleveland, but there is still room for another ship or two that might be completed about the opening of navigation next spring. A second Crosthwaite steamer, also intended for salt water service, is nearing completion at the works of the Union Dry Dock Co., Buffalo. She will probably be turned over to her owners about Oct. 1. The large package freight steamer building at the Buffalo yard, and which was contracted for last winter, will probably not be finished in time for service this fall, but in any event the Union works will have place for a new vessel or two to be delivered next spring.

It is quite within probability that the light-house board will ask the lake ship builders informally for proposals to build the Sumac, the light-house tender designed for service in the ninth light-house district, which practically includes the whole of Lake Michigan. When bids were solicited for this vessel some time ago none were received. The cost of material had so advanced that bidders did not think it worth while. The orignal appropriation for this vessel was $85,000, which was later increased to $100,000. One-half of the $100,000 was made immediately available in the sundry civil bill. The Sumac was fully described in the Review of May 31. She is to be a twin-screw steamer of the following dimensions: Length over all, 170 ft.; length between perpendiculars, 160 ft.; depth of hold, 14 ft.; displacement, 700 tons; maximum speed, 15 miles. She is to be equipped with jet condensing engines of 750 indicated H. P. with cylinders of 18 and 34 in. diameter and 28 in. stroke. Steam will be supplied by two Scotch boilers. No doubt the light-house board would entertain a bid within the appropriation for her immediate construction.

The steamer Ottawa, built by the Bertram Engine Works Co. of Toronto for the Canada Atlantic line (Chicago to Parry Sound) has had a trial trip and is ready for service. The Ottawa is a package freight steamer of the type best suited to take advantage of the extra depth in the new Canadian canal system. She is 257 ft. long over all, 43 ft. beam, 25 ft. 6 in. deep and will carry about 70,000 bushels of wheat on the canal draught of 14 ft. The machinery consists of a triple expansion engine, 17 in., 28 in. and 46 in. diameter of cylinders, 32 in. stroke, and intended to develop about 800 I. H. P. The boiler is 13 ft. 6 in. diameter and 12 ft. long, and is provided with Howden hot draft apparatus. She has also a donkey boiler 7 ft. 6 in. diameter, provided for the running of the electric lights. Water ballast tanks extend the whole length of the boat, and are of a depth of 4 ft. The vessel is fitted throughout with the latest improvements.

No definite distribution can be made as yet of the orders for seventeen steel vessels now booked by the American Ship Building Co., but it is thought the work will be divided about as follows: Lorain yard, four steamers for J. C. Gilchrist and others of Cleveland; South Chicago, four steamers ordered by eastern syndicate for Atlantic coast service; Globe yard, Cleveland, two steamers for Capt. John Mitchell and others of Cleveland; Detroit, one steamer for D. C. Whitney of Detroit, and two steamers for J. C. Gilchrist and others of Cleveland; West Bay City, two steamers for D. R. Hanna and others of Cleveland; West Superior, two tow barges for D. R. Hanna and others of Cleveland.

For some time past officials of the Maytham Towing & Wrecking Co. of Buffalo, which is operated in opposition to the consolidated harbor tug lines, have been talking of the construction of new tugs, but there is no immediate indication of an order from them. The latest report from Buffalo is that they will build ten tugs, costing probably $500,000, and that the vessels will be duplicates and of about 86 ft. length, 21 ft. breadth and 10½ ft. depth. Each tug will be equipped with compound engines of 16 and 34 by 28 in., and a boiler of 10½ by 14 ft., allowed 175 pounds steam pressure.

POLLOK PRIZE IS WITHHELD.

It will be remembered that the heirs of Mr. Anthony Pollok of Washington, who lost his life by the foundering of the French steamer La Bourgogne, offered a prize of 100,000 francs for the most effectual apparatus for saving life on the high seas, and the task of awarding the prize was by the maritime section of the Paris universal exhibition intrusted to an international jury. This jury appointed a commission of experts to report on the different kinds of apparatus submitted by competitors, consisting of the following: Capt. J. Clavaud of the French navy; M. Joannes Couvert, president of the Havre chamber of commerce; Capt. Stephane Dechaille, director of the French signaling and life-saving system; Capt. Siegel, of the German navy and German naval attache in Paris; M. A. Pierrard, Belgian marine engineer; Lieut. Sims, of the United States navy; Capt. Nepean, of the British navy; Signor Fasella, director and professor at the Royal Italian Naval Engineering School; M. Christophersen, Norwegian consul general; Rear Admiral Nicholas de Naoumow, of the Russian navy, and inspector general of the Russian Lifeboat Institution; Capt. Wallenberg, member of the Swedish upper house and officer of the Swedish naval reserve. This commission has now ended its labors, and recommends that the international jury should not award the prize in its entirety at present. It is therefore probable that the competition will be kept open for two or three years longer, under conditions that will be published later on. In the meantime the implements and apparatus submitted by the competitors are placed all together on the terrace of the Palais de la Navigation de Commerce, fronting the Seine. The collection is said to be well worthy of inspection, embodying, as it does, many new and original and really valuable ideas.

A dispatch from Newcastle, England, says that agents of the French government are making inquiries in the northeastern British port for steamers available for carrying 1,000,000 tons of coal from Norfolk, Va., to France within the next fifteen months. Three steamers have already been chartered to carry coal from Norfolk to Marseilles. They are the British steamers Raithmoor, 1,500 tons; Reynolds, 2,083 tons, and the Trevanion, 1,566 tons.

SHIP BUILDING IN GERMANY.

DESCRIPTION OF KAISERLICHE WERFT, A GERMAN NAVY YARD CREDITED WITH THE CONSTRUCTION OF MANY MODERN VESSELS OF WAR.

BY GEORGE CROUSE COOK.

A series of articles on German ship building could not be complete without a description of government naval construction as carried on at the Kaiserliche Werft, or navy yards. Of these works there are three. The largest is at Wilhelmshaven on the North sea, the smallest at Danzig on the Baltic, while the third to be described herewith, is a happy in-between, representative of both, and is in Gaarden, a small town on the Kiel bay opposite the city of Kiel. Foreigners are not allowed to visit the yard except by permission from naval headquarters, granted upon application from representatives of the different countries at Berlin. Even then it is impossible to acquire complete information regarding the works, as much secrecy is maintained. In certain parts of the works the men employed are sworn to secrecy and punishment meted out for violation of rules on this score.

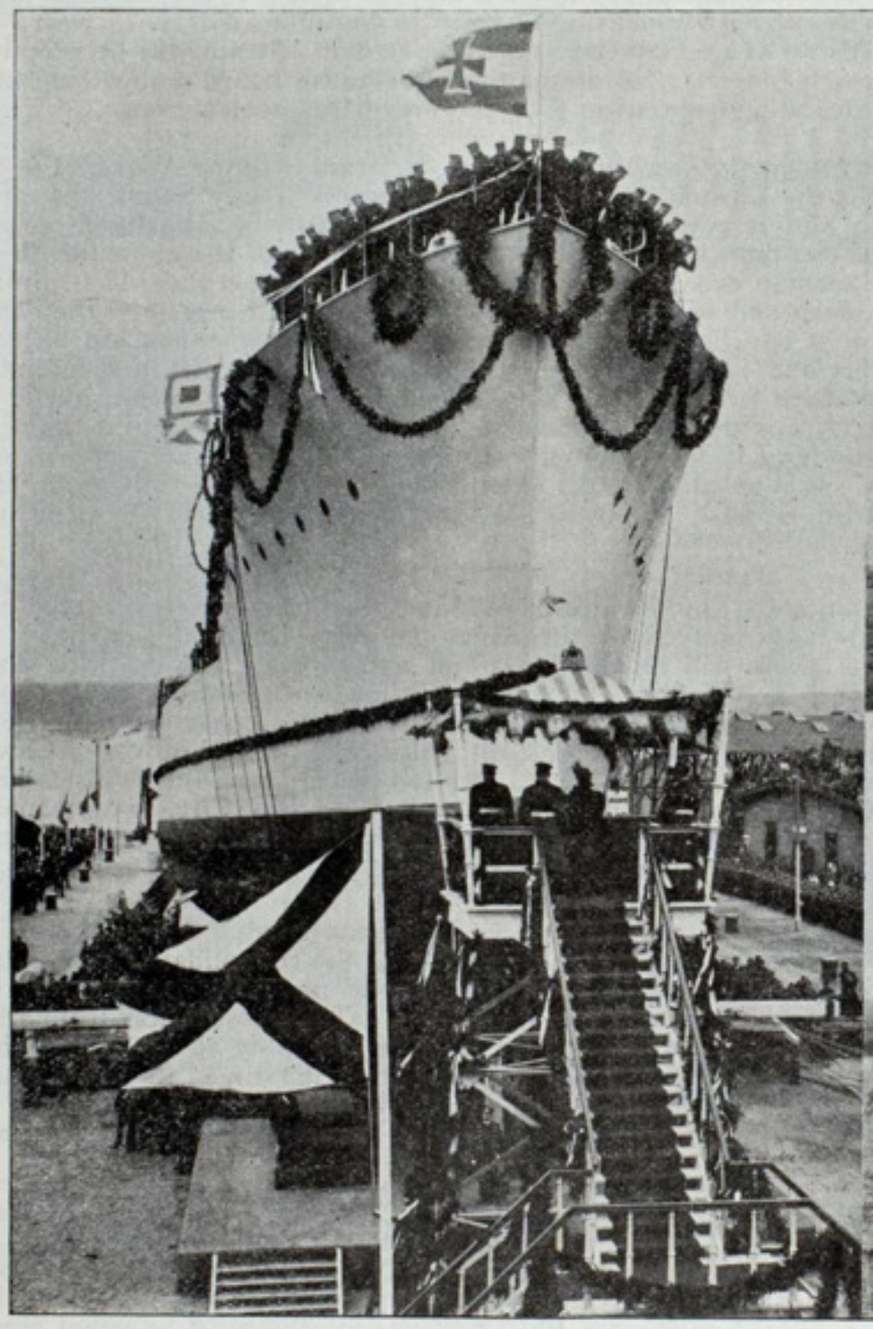
Affairs of the yard are directed by the navy department at Berlin, the executive on the ground being a regular naval officer of the rank of sea captain. This captain has his own independent staff of men who execute the orders from Berlin, oversee the yard and are accountable for the condition and appearance of the grounds, houses and shops. The actual construction, however, is in the hands of the construction corps, which consists of an especially trained body of men quite apart from the line officers, and working under a flag other than that of the German navy.

The construction corps is divided into engineers and ship builders, both being recruited from the Royal Technical High School at Berlin, where all regular students, that is, native born Germans who are gymnasium graduates, may become candidates at the state examination for a commission to the lowest rank of a ship or engine constructor. These men are given the finest scientific education that is to be had in Germany. The course of training at the high school is very thorough. It extends over a period of five years, and in addition to the theoretical studies the candidates for these honors are required to serve one year as volunteer handworkers in ship yard or machine shop, and at a certain period after their commission they are ordered to a modern warship for a five-months' cruise. They are promoted in rank only when showing ability and qualifying in a bona fide examination. Assistants to these constructors are native Germans of a more or less educated class of draftsmen, and they are usually able, practical men, who have risen from the lower grades, but they must remain for all time in positions subordinate to the commissioned constructors. For this reason the government service, although offering fair pay and short hours, is not considered desirable by any ambitious young men who may not have had the specific training of the high school. The yard workmen must be, as the men above them, Germans. They are well trained and work with great pains and extreme care, but the great loss of time involved in their methods is such as to render them unfit for competitive, commercial work.

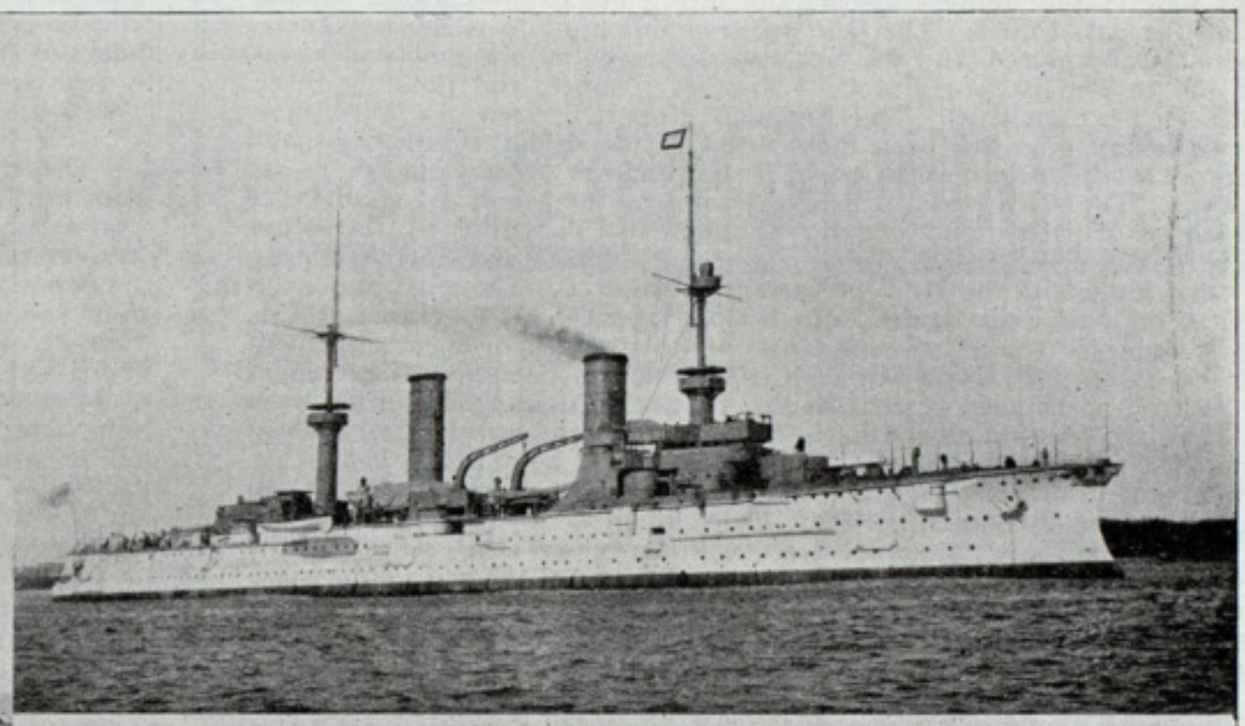
The yard itself lies north and south on the eastern shore of the Kiel bay, and it is laid out with that accurate precision and care which is a universal characteristic of government works. Grass plots and flower beds are to be found everywhere, neat shaded walks run about the yard and all the shops are as bright and clean as care can make them. Even the tools, although of the conventional German and Scotch types, seem to partake of the same spirit and run with a quietness and dignity unknown in commercial surroundings. On the shore of the bay to the left of the main gate, which is on the southern limit of the yard, are the three permanent building and launching ways. From the first of these the armored cruiser Prince Henry was recently launched and on the third a similar vessel, now known as "Cruiser B," is under construction. These ways, which are made up solidly of stone and brick, are carried down to some distance below the water level of the bay, and at this point sides are built up as at the entrance of a dry dock. When a ship is being laid down a caisson is put in place and the water pumped out, giving free, dry ground at a desirable point, and at launching the caisson is removed, the water rises to some height about the stern and the vessel has but a short run before clearing the ways. The work here is carried on with the same painstaking care as is shown in the ways themselves. An elaborate lumber scaffolding is built about the ship, with the first platform almost the height of the armor shelf, and a second level about 8 ft. above this, upon which is a track with a traveling steam crane. The process of erection of the hull is one of extreme care, no pains or expense being spared in any detail to produce a perfectly accurate strong body. The ship machine shops stand just in from these ways. Nearly all the tools are of German manufacture, but the largest pieces bear the mark of some Scotch or British tool works. Back from the machine shops is a splendid mold loft with a narrow plank floor, perfectly fitted and painted a light gray. It is lighted from all sides and overhead. Elaborately colored drawings are laid down here of the stern, stem and rudder frame, and the whole ship's lines laid out in pencil and faired up with water lines, buttocks and diagonals.

Just north of the ways on the bay shore is the torpedo boat harbor, protected from the sometimes rough water of the bay by a long sea wall running parallel with the shore, with a section at right angles connecting the northern end with the shore. Here torpedo boats out of commission are laid up and here they come for coaling and repairs. A simple, efficient marine railway for torpedo boats is arranged at this point. Five sets of track at right angles to the shore run with gentle incline into the water. Upon each track is a car with blocks of suitable form for supporting a boat. These cars are let down into the water and the boat to be docked is floated over them, set, and then drawn by chains from one revolving shaft. The cars bring up the boat without disturbing the officers or men who may be working and living on board during the period of repairing or cleaning. By placing additional cars on the tracks

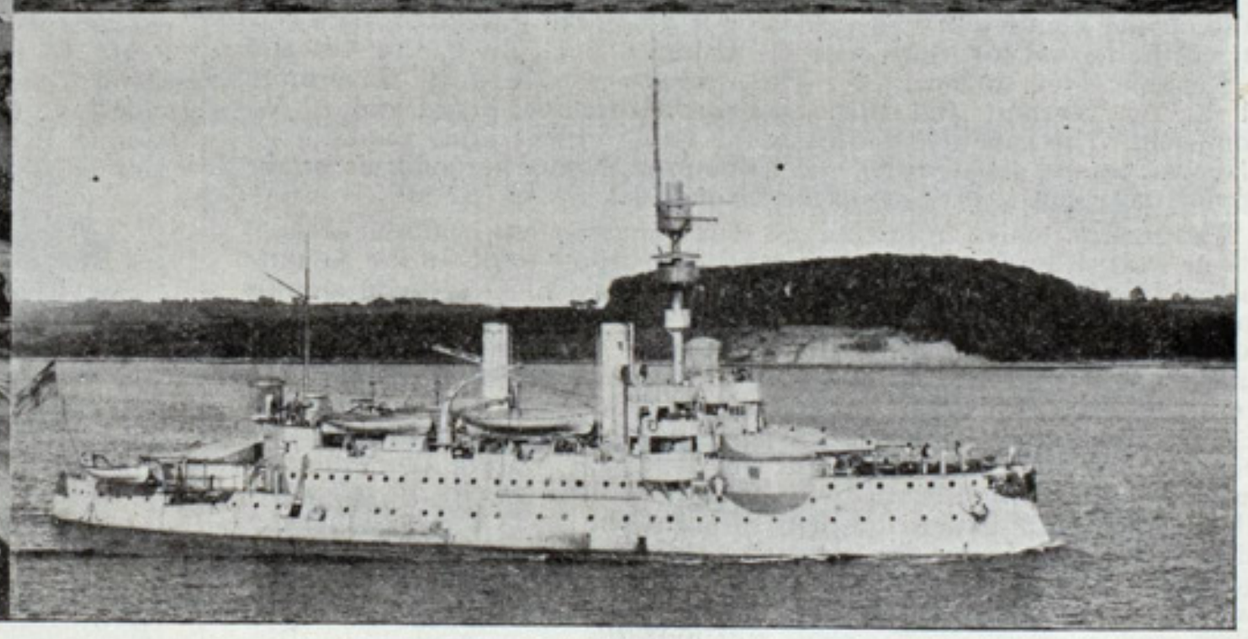
Ships Built and Building at Kaiserliche Werft, Kiel, Germany.



LAUNCH OF STEEL ARMORED CRUISER PRINCE HENRY.



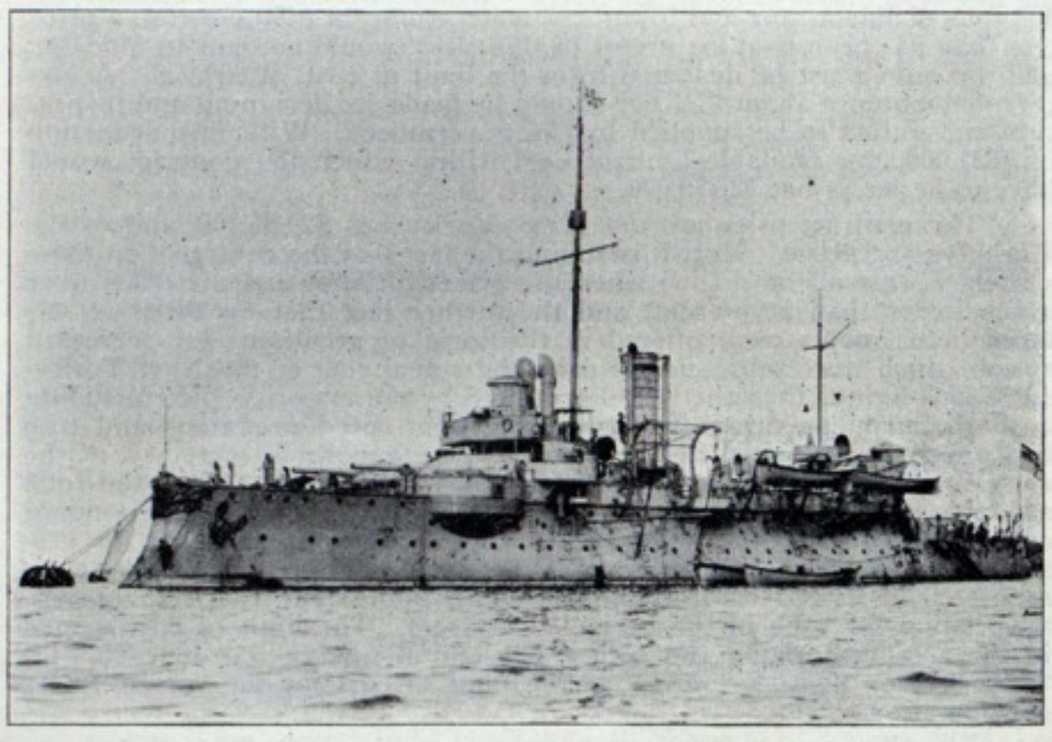
FUERST BISMARK, A STEEL ARMORED CRUISER.



COAST DEFENSE BATTLESHIP AEGIR.

two or more boats may be drawn up at the same time. Along the shore are special sheds for torpedo boat repair work and also the shops for manufacturing torpedo bodies; these, however, are forbidden sections of the works, and even a special permit will permit of but a disconnected view of them.

Above the torpedo boat harbor at right angles to the bay is a deep artificial basin, both shores of which are lined with storehouses. Ships about to be commissioned or setting out for a cruise come to this point for supplies, provisions, ammunition, etc. This basin forms the northern boundary of the yard. South of the "supply basin" is a narrow channel leading to a second basin, into which the four dry docks open. This is called the "building basin." Here extensive repair work is performed and ships completed after launching. About the sides of this basin stand enormous electrically-powered shear-legs for handling engines, boilers, armor plate, etc. Here also temporary portable sheet metal sheds are set up at convenient points and fitted with the lighter tools. The four docks are of stone, each fitted with an independent set of pumps but so arranged that they may be concentrated on any single dock, and thus the largest may be emptied in five hours. Recently in one of the docks a 3500-ton coast-defense battleship, the Heimdall, was cut amidships, one end drawn out some 26 ft., and that additional length of ship built in. The work was similar to that done on the United States gunboats Castine and Machias at the Brooklyn navy yard some years ago and with equally satisfactory results. An incident that caused some amusement among the thorough and precise Germans occurred here a short time ago. When a Turkish cruiser, which is to be reconstructed at the Germania ship yard, was docked, through courtesy of German government, it was found that one blade of her four-bladed propeller had been



COAST DEFENSE BATTLESHIP HAGEN, BUILT AT KAISERLICHE WERFT, KIEL, GERMANY.

broken off. From the sea growth over the broken section it was quite plain that the blade was lost at least a year previous, although it was wholly unknown. The Turkish officers who had been cruising about in the ship were entirely ignorant of what had occurred.

The engine and boiler shops, together with a foundry, are located close to this building basin and all are well fitted throughout. The engine shop in particular is most elaborately arranged and is supplied with the highest type of modern German machinery. Many of the larger tools and the overhead traveling crane are worked by independent electric motors, and all lathes, drills and planers are so arranged that any section or particular machine, may be thrown off without effecting general utility. Engines for all the vessels recently constructed here were made in these shops and they are excellent examples of the finest German naval engineering.

Between these shops and the main gate stand the office buildings—those of the executive staff and construction corps. They are of a kind suited to the dignity of the tenants. They are fitted with more comforts and labor saving devices than can ever be used, and this may be said also of nearly every department of the yard. It is to be regretted that so complete a plant cannot be worked on a business basis. It may be worth noting also that near the yard gate is an excellent workingmen's club, organized by a society corresponding to our Y. M. C. A., where the men are entertained and given general popular instruction for a nominal charge. Four vessels built and building at these works are pictured in the illustrations. Leading particulars of these are as follows:

Prince Henry (building)—Steel armored cruiser; displacement, 8,900 tons; length, 393½ ft.; breadth, 64 1-3 ft.; draught, 24 ft.; armor belt, casemate and turrets, 4 in. thick; waterline deck, 1½ and 2 in.; three screws with three triple expansion engines; I. H. P., 15,000; speed, 20.5 knots; complement, 501; keel laid in 1898. Armament—Two 24 cm. quick-fire in two turrets; six 16 cm. quick-fire in two casemates; four 15 cm. quick-fire in four turrets; ten 3.7 cm. machine guns; ten 8.8 cm. quick-fire; three torpedo tubes, one of 45 cm. in bow and two of 45 cm. in sides.

Fuerst Bismark (just completed)—Steel armored cruiser; displacement, 10,650 tons; length, 393½ ft.; breadth, 65½ ft.; draught, 26 ft.; armor belt and turrets (main), 8 in.; secondary belt, casemates and small turrets, 4 in.; protective deck, 1¼ to 2½ in.; wood sheathed; three screws with three triple expansion engines of 13,500 I. H. P.; speed, 19 knots; complement, 568; keel laid in 1896. Armament—Four 24 cm. quick-fire in two turrets; six 15 cm. quick-fire in six casemates; six 15 cm. quick-fire in six turrets; ten 8.8 cm. quick-fire; ten 3.7 cm. machine guns; five torpedo tubes, one of 45 cm. in bow, four of 45 cm. in sides and one of 45 cm. in stern.

Aegir, coast defense steel battleship—Displacement, 3,530 tons; length, 240 ft.; breadth, 49½ ft.; draught, 7½ ft.; armor belt, 9 in.; turrets, 8 in.; protective deck, 2 and 3 in.; two screws and triple expansion engines of 4,800 I. H. P.; speed, 14½ knots; complement, 276; keel laid in 1892. Armament—Three 24 cm. in three turrets; ten 8.8 cm. quick-fire; six 0.8 cm. machine; three torpedo tubes of 45 cm., one in bow and two in sides.

Hagen, coast defense steel battleship—Displacement, 3,500 tons; length, 240 ft.; breadth, 49½ ft.; depth, 17½ ft.; armor belt, 10 in.; turrets, 8 in.; protective deck, 1¼ in.; two screws and two triple expansion engines of 4,800 I. H. P.; speed, 13 knots; keel laid in 1891. Armament—Three 24 cm. in three turrets; eight, 8.8 cm.; six 0.8 cm. machine guns; four torpedo tubes of 35 cm., one in bow, one in stern and two in sides. This is the ship that was lengthened 26 ft. by insertion of middle body.

TALK WITH A RUSSIAN NAVAL INSPECTOR.

General N. Kouteynikoff, chief inspector of naval construction for Russia, sailed from New York on the American line steamship St. Paul last week. This officer's visit to this country was for the purpose of inspecting the war vessels under construction for Russia at the Cramp yards, Philadelphia.

"I have been here on government business," he explained, "and that business has been in connection with the cruiser Variag and the ironclad Retvzan, which are building at the Cramp works. The Variag has already had her trial, and the Retvzan will be completed in about nine months."

"Why did Russia decide to build ships here?"

"We had an extensive naval program to carry out, and in order to complete it, it was necessary to build a number of ships at once. For this reason orders were placed in Germany, France and the United States; our yards were full. The work which has been done here for Russia will compare most favorably with that done in any country. The new cruiser Variag is a remarkable ship. Unfortunately, I was not here in time to go on her trial trip. On that trip she made faster time than was called for in the contract. I believe the record of her trial was 24.6 knots, while the contract only called for 23 knots. These vessels when they are turned out by your yards will be complete, and very little will be done to them when they reach Russia. The guns will be mounted here, and the finishing touches put on so that they will practically be ready for service," he added. Speaking of the work of the Russian yards, the general added that they could turn out a battle-ship of the Majestic (English) class in two or three years. "Of course, I know that in England vessels have been turned out in quicker time," he added, "but you know that we work slowly, and with great care. Twenty-five years ago, when I was a very young man, I paid a visit to the United States, and so this second visit has been unusually interesting to me. On every hand I see the wonderful improvements made here. The same improvement which is to be seen in ship building is seen in everything and everywhere. While here I saw your ship Alabama. She is a fine type of a sea-fighter."

TRIAL OF THE ALABAMA.

Over the Cape Ann course the trial trip of the battleship Alabama will take place, probably on Aug. 27. The ship left the Cramp yard, Philadelphia, last week, for the Brooklyn navy yard. While on the blocks of the Brooklyn dock the Alabama is to be thoroughly scraped and painted. A specially prepared paint, designed for use on ships' bottoms to prevent them from fouling, will be used below the water line. Novel in one respect, the Alabama will have her course marked out by the most formidable gathering of warships that ever welcomed any new ship into the navy. Orders have been received at the Charleston navy yard to the effect that the battleships Kearsarge, Kentucky, Indiana, Massachusetts and Texas and the double-turreted monitor Amphitrite will rendezvous in President Roads, Aug. 25, and that they are to act as station ships during the trial of the latest addition to our navy. The ships, excepting the Amphitrite, are at present on the coast of Maine. The monitor is at New Bedford. The tug Iwana of the local yard will take the engineer corps down the harbor to the new ship. The board which is to take charge of the trial and to report on it is made up of the following named naval officers: Rear Admiral Frederick Rodgers, Capt. Robley D. Evans, Com. Joseph N. Hemphill, Com. Charles R. Roelker, Lieut. Com. Charles E. Vreeland, Lieut. Com. Richard Henderson and Naval Constructor Washington L. Capps. The ship will run four hours under forced draft, and must attain a speed of at least 18 knots for each hour.

STEAMERS FOR ORIENTAL SERVICE.

Within a few days the contract of the Oregon Railway & Navigation Co. with Dodwell & Co. for the maintenance of a line of steamers between Portland, Ore., and the Orient will expire. The company has been negotiating for vessels to take the place of those now on the line, but owing to the urgent demand for steamers for transport service, have been delayed in securing vessels, so that the new line will not be ready to take up the business before October. Three steamers have already been secured, but as they will not be available in time to prevent a break in the service Dodwell & Co. will operate the line for at least sixty days longer, both the Monmouthshire and Braemar coming back again in the old line. The new steamers which will replace the old line will be 6,000-ton carriers, newly built and equipped with the latest improvements for rapid and economical handling of freight. While slightly larger carriers than the Braemar and Mogul and other vessels of that class, they are so constructed that they will draw no more water than those vessels, and accordingly no delay will be experienced in getting up and down the river.

A school has been established by the government at Fort Monroe, Va., for the purpose of instructing regulars in the application of electrical machinery used in the army. The rules, published by direction of the secretary of war, provide that the applicant must be under twenty-five years of age, unmarried, qualified as a gunner, a student of a correspondence school or the owner of electrical books, and no applicant will be recommended unless he has sought for a year or more to become practically familiar with one or more classes of electric machinery or with some portion of the elementary literature on electricity.

HICHBORN'S PROTEST.

A WARM LETTER TO THE SECRETARY OF THE NAVY ON THE SUBJECT OF PROTECTED CRUISERS—BITTER CONTROVERSY BETWEEN HEADS OF SHIP BUILDING BUREAUS.

A controversy, which has become personal in its acrimony, is now waging in Washington on the subject of the protected cruisers authorized by the act of June 7, 1900. Chief Constructor Hichborn is entirely at variance with the rest of the board on this subject. He maintains that the circular recently issued by the board on the protected cruisers really designs an armored cruiser and consequently violates the intent of congress. The chief constructor stoutly maintains that congress knew what it was about when it specified that three armored cruisers should be constructed. Incidentally the chief constructor reveals the fact that he leans somewhat to the protected cruiser which he describes as a commerce destroyer. He submits a design of a vessel to maintain a speed of 23 knots after the Russian and French type—the Variag and Chauteaurenault. This is a class of cruiser which has no counterpart in the British navy, having slight defensive and offensive qualities and depending wholly upon superior speed to get out of danger. The protected cruiser would make short work of an ocean liner or auxiliary cruiser, but in turn an armored cruiser or battleship would make short work of a protected cruiser. The type probably never will be popular, for its chief defense is speed, and speed is frequently a difficult thing to maintain. No condition must be wanting to maintain 23 knots, and in active service conditions are sometimes wanting. Machinery will give way. The minority report of the chief constructor, or rather his protest against the circular, dated Aug. 6 and addressed to the secretary of the navy, is as follows:

"Referring to the report of the majority of the board of construction, submitting the circular proposed by it, defining the chief characteristics of three protected cruisers, authorized by act of congress, approved June 7, 1900, I have to state that I do not concur in the action of the board in submitting said circular, and do not approve of the circular submitted. Under title 'Increase of the Navy,' enacted June 7, 1900, provision is made for 'two sea-going battleships, carrying the heaviest armor and most powerful ordnance for vessels of their class * * * * * and to cost, exclusive of armor and armament, not exceeding $3,600,000; three armored cruisers of about 13,000 tons trial displacement, carrying the heaviest armor and most powerful ordnance for vessels of their class * * * * and to cost, exclusive of armor and armament, not exceeding $4,250,000; and three protected cruisers of about 8,000 tons trial displacement, carrying the most powerful ordnance for vessels of their class * * * * and to cost, exclusive of armament, not exceeding $2,800,000.'

"It will be observed from a reading of this act that congress provided for three types of vessels—battleships, armored cruisers and protected cruisers. The act provides that the battleships and armored cruisers shall carry the heaviest armor for vessels of their class. It omits any provision for armor for protected cruisers, showing clearly that it was not the intention that said cruisers should carry armor. Said act limiting the cost of battleships and armored cruisers provides that the limit of cost shall be the amount stated, exclusive of armor and armament. With reference to the protected cruiser, the act states that the cost shall be not exceeding $2,800,000, exclusive of armament.

"The circular submitted by the majority defines the chief characteristics of the three armored cruisers, and not of the protected cruisers, as authorized by the act of congress, approved June 7, 1900. That congress in recommending the three protected cruisers in question, thoroughly understood the distinction between armored cruisers and protected cruisers, is clearly shown by a reference to page 24, of the report No. 930, house of representatives, fifty-sixth congress, first session, being the report from the committee on naval affairs, submitting the naval appropriation bill. It is therein stated, and credit is given to the office of naval intelligence for having furnished the information to the house naval committee, that 'armored cruisers are vessels of moderate to large tonnage, with protection to hull and battery similar to that of battleships, except that the thickness of metal in all cases is much less, which, with the weight saved by carrying lighter guns, gives opportunity to make the speed and steaming radius of the armored cruiser much greater than the battleship.' 'Protected cruisers are vessels usually of small to moderate tonnage, with protection to hull by protective deck, coal bunkers and cellulose. No side armor; no turrets; barbettes or casemates; guns protected by gun shields.' Had congress with this information before it, desired the construction of three more armored vessels, they would undoubtedly have authorized the construction of armored cruisers instead of protected cruisers.

"The circular of the majority of the board on construction describes an armored vessel which, although larger than the New York and Brooklyn, is not superior to these vessels in many respects. The armored vessel produced on such lines would be nothing but a second-class armored cruiser as compared with the six vessels of the California class, which are first-class armored cruisers. The protected cruiser is designed for a special field of action. She is intended to prey upon the commerce of the enemy, and therefore on this type of vessel armor is sacrificed for high speed and ability to keep the sea for extended periods, protection being afforded by protective decks, arrangement of coal bunkers and cellulose in cofferdams. Protected cruisers have lately been built for the Russian and French navies with speeds of 23 knots. The United States would be behind other nations by building protected cruisers of less speed, which vessels would be unable to meet on even conditions the large passenger vessels of the merchant marine converted to naval use.

"The provisions as to speed in the act of June 7, 1900, are that the battleships shall 'have the highest practical speed and great radius of action'; the armored cruisers 'the highest practical speed and great radius of action'; the three protected cruisers 'the highest speed compatible with good cruising qualities and great radius of action.' It will therefore be observed that congress makes a distinction between the battleships and armored cruisers and the protected cruisers, the protected cruisers being required to have the highest speed compatible with good cruising qualities and great radius of action. I am of the opinion that such conditions can only be met by sheathing the vessels, which I believe to have been the intent of congress. The question of the advisability of sheathing the battleships and armored cruisers, provided for in the act of March 3, 1899, was considered by the board on construction, and the majority of that board recommended to the department that, with reference to these two classes of ships, congress be asked to modify the law. The majority and minority reports on the subject were submitted by the honorable secretary of the navy to congress for its consideration. Hearings on the subject were given Admiral Dewey and other officers by the naval committee. After a thorough investigation of the subject no change was authorized in the requirement of the act of March 3, 1899, as to sheathing and coppering. In view of the fact that the appropriation, as made under the act of June 7, 1900, is identical with the estimates furnished by this bureau for protected cruisers, sheathed and coppered, and taking into consideration also other facts connected with the passage of this act, of which the department has been advised, I am of the opinion that it was the intention of congress that the protected cruisers should be sheathed and coppered. Furthermore, no question was raised by the majority of the board on construction as to the advisability of sheathing and coppering protected cruisers.

"I will not attempt to discuss this circular in detail, as I consider it fundamentally unsatisfactory, and at variance with the requirements as authorized by congress. The limit of cost, $2,800,000, precludes the construction of vessels as described by this circular, as the cost of all hull armor, even admitting that the use of armor is permitted by the act of congress, must, under a decision of the attorney general, dated Jan. 31, 1889 (No. 504 navy department, judge advocate general's office), be deducted from the limit of cost. The majority estimates the cost of this armor at $100,000. The weight of the side armor or main belt is stated at 228 tons. The lower casemate armor, 192 tons. A portion of the upper casemate armor must be considered with this item, but, omitting this, the 420 tons of side armor and lower casemate armor, at $400 per ton, a price less than has been paid for armor of this class, would amount to $168,000, and this sum must be deducted from the limit of cost, $2,800,000. A further deduction of about $153,000 should be made for designing and inspection and outfits to be supplied by the government. With this deduction of $321,000, the available limit of cost within which the contract would have to be let, is but $2,479,000.

"The contract price of the New York was $2,985,000, and of the Brooklyn $2,986,900. Notwithstanding the fact that the contracts on these vessels were made at a time when the prices of labor and materials were much lower than at present, and the further fact that on these vessels large inducements were offered in the form of premiums for increased speed, which were subsequently paid, the actual cost of the New York—1,300 tons lighter than the vessel proposed by the majority—not including cost of armament, armor for gun protection, speed premiums and trial trip expenses, as stated in the report of the honorable secretary of the navy for 1899, page 10, was $3,593,294, or $793,294 more than the total available appropriation for the protected cruisers. The corresponding cost of the Brooklyn—285 tons lighter on trial displacement than the vessel proposed by the majority—is given on page 12 of the secretary's report, 1899, as $3,391,349.41, or $591,349.41 more than the available appropriation for each of the protected cruisers. The limit of cost named in the acts authorizing the New York and Brooklyn was in each case $3,500,000, or $700,000 more than the limit of cost for the vessels under consideration.

"The chief constructor is prepared to furnish a circular, and design a protected cruiser, meeting, in all respects, the requirements of the law, and carrying the battery, except the 1-pounders in military tops, desired by the majority of the board, being a sheathed protected cruiser of about 8,500 tons displacement, and having a speed of 23 knots, one knot additional to that required by the majority, having the same coal capacity on a less displacement, and with consequently greater radius of action. Such a vessel can be designed and built within the limit of cost. Following is a comparative statement of the dimensions of the vessel proposed by the majority and minority:

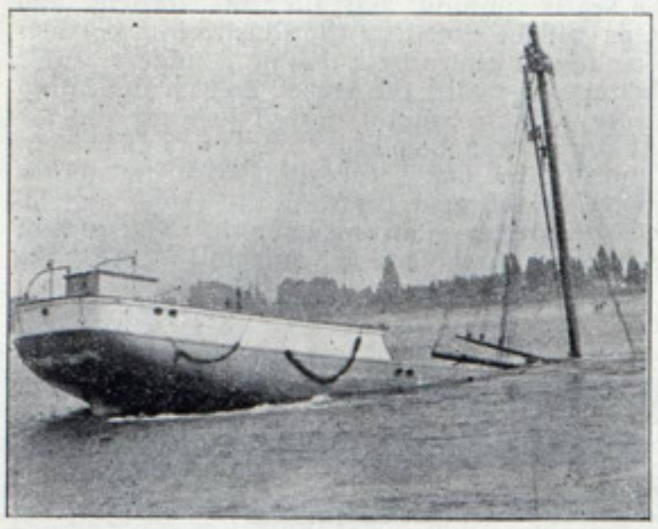
	Design by the chief constructor.	Proposed by majority of board on construction Aug. 6, 1900.
Displacement	8,500 tons.	9,500 tons.
Length on L. W. L.	410 ft.	424 ft.
Breadth, extreme, approximate	64.5 ft.	66 ft.
Mean draft, dimensions	23 ft. 6 in.	23 ft. 6 in.
Tons, per 1 foot, about	43	46
Coal, full supply	1,500 tons.	1,500 tons.
Speed	23 knots.	22 knots.
I. H. P.	23,000	21,000
Number of officers	40	40
Number of men	525	525
Armament.	14 6-in R. F. 18 14 pdr. 12 3 pdr. 4 1 pdr. 2 3-in. field. 2 Gatlings. 8 Colts. Small arms.	14 6-in R. F. 18 14 pdr. 12 3 pdr. 12 1 pdr. 2 3-in. field. 2 Gatlings. 8 Colts. Small arms.
Protective deck center over machinery	1½-in.	2-in.
Protective deck slope over machinery	3-in.	3-in.
Protective deck slope forward and abaft machinery	1½-in.	3-in.
Protective deck center forward and abaft machinery	1½-in.	2-in.
Cellulose	55 tons.	66 tons.

"I recommend that the protected cruisers St. Louis, Milwaukee and Charleston, authorized by the act of June 7, 1900, be built as protected cruisers in reality, as required by law; to be sheathed and coppered, and to be of about 8,500 tons trial displacement, with the general characteristics stated in the preceding table."

The ship building business of Eureka, Cal., formerly conducted by H. D. Bendixen, has been incorporated and will hereafter be known by the name H. D. Bendixen Ship Building Co. The plant has been in operation since 1873 and consists of fourteen acres of land with 1,000 ft. of water frontage. On the stocks at present are the four-masted barkentine John Palmer, building for Suden & Christensen, of San Francisco, and a four-masted schooner, building for Joseph Knowland, of San Francisco. As soon as the barkentine is launched a companion schooner to the one now on the stocks, will be built for Mr. Knowland.

STORY OF THE FONTANA ACCIDENT.

Libel proceedings against the steamer Inter Ocean on account of the sinking recently of the Cleveland schooner Fontana in the St. Clair river tell the story of the accident from the standpoint of the owners of the Fontana. A different story will, of course, be told by those interested in the other vessels that are involved in the matter. Owners of the Fontana claim damages aggregating $90,698, this including vessel, cargo and loss on account of the vessel's season charter. The libel states that at 11 o'clock on the night of Aug. 3 those navigating the Kaliyuga made out the lights of the Appomattox and Santiago. A short distance back of them, to the west, could be seen the lights of the Inter Ocean. When the two tows were still a mile apart the Kaliyuga blew two whistles, indicating her desire to pass to the port, or Canadian side of the Appomattox and consort, thus moving out of the way of all three boats going up. The Appomattox promptly answered. Later, to be sure of his position, the Kaliyuga's master repeated the two blasts, and the Appomattox did likewise. Immediately after the first signal the Kaliyuga began to pull over toward the Canadian side. At the second signal the Kaliyuga checked down until the red light of the Santiago was shut out of view, when her master rang his engineer to go ahead at the usual speed. She had hardly time to attain it when she and the Santiago were nearly abreast, and the latter began to sheer toward the Kaliyuga. To avoid the schooner, the Kaliyuga's wheel was put hard a-starboard and she was checked down. The Santiago passed the Kaliyuga's bow by 20 ft., and her starboard bow grazed the starboard quarter of the steamer, which had meantime swung her wheel hard a-port to avoid the schooner at her stern. When the schooner began her sheer the Kaliyuga's master blew a danger signal to his consort, the Fontana. Just as the latter began to swing to port, in obedience to the signal, she was struck at the bluff of the starboard bow by the Santiago, which it is alleged was traveling seven miles an hour, while the Fontana was going at the rate of six. The charge as regards the Inter Ocean is that she was but a short distance from the Santiago at the time of the collision, and trying to pass the latter; that a current setting partly crosswise "walled" up the water between her and the Santiago, and that this current was of such volume and power as to cause the big schooner to sheer, and that once she began to sheer her rudder had little if any control of her.



COMBINED BELL AND LIGHT BUOY.

A gas buoy giving light similar to all other buoys of its kind, but containing also a bell attachment, will shortly be in operation at the government cut, Lake St. Clair. This new type of buoy, in which a bell is struck at regular intervals by an automatic attachment connected with the gas that provides the light, was described and illustrated in these columns some time ago. It is manufactured by the Safety Car Heating & Lighting Co. of New York, who control the patents on the gas buoys, and has been under test by that company for some time, but is now to be tried for the first time by the United States light-house officials. A second buoy of the same kind will be given an official trial by the government in New York harbor. There is practically no loss of gas in the operation of the bell. Arrangements for the test on the lakes, which will be watched by Capt. Wilson of Detroit, inspector of the eleventh light-house district, were made by Mr. Wm. St. John of the New York company, who has just concluded a trip around the lakes. Mr. St. John, who returned to New York by way of Quebec, reports that the order of the Canadian government for thirty-five gas buoys for the lakes has been augmented by ten more, to be stationed at different points on the St. Lawrence between Montreal and Quebec.

AROUND THE GREAT LAKES.

C. H. Donaldson and J. B. Rodgers, executors, 202 Main street, Buffalo, advertise for sale elsewhere in this issue a three-sixteenth interest in steamer Samoa and a tenth interest in the steamer Cuba, as well as 62½ shares of Frontier elevator stock, Buffalo. Bids will be received up to Sept. 4.

The steamer Argonaut, which sprang a leak and went to the bottom immediately after being loaded with ore at one of the Escanaba docks, was a very old vessel. She is in about 20 feet of water. The starboard side is almost completely submerged. The Argonaut is owned by J. A. Mills of Port Huron.

It is expected that about 825 feet of the new breakwater at Fairport, Lake Erie, will be completed before the close of navigation. All work is now on the west breakwater, which is to be 2,000 feet long when completed, and will run in a line nearly north and south. The east breakwater is to be 1,500 feet long and will run in a line about east and west, thus forming a sort of a letter A, with the point out in the lake. The lake ends of these two breakwaters will be 500 feet apart and the shore end will be 2,000 feet apart in a straight line. It is expected that this triangular form of structure will admit of easy entrance of vessels and will prevent the formation of sand bars that have been a great annoyance at the mouth of Fairport harbor. Breakwaters are also to be built at Lorain, Ashtabula and Conneaut.

It is rumored at Frankfort-on-the-Main that capitalists of Bremen, Hamburg, Brussels and Antwerp have formed a company to erect large ship yards at Hoboken, N. J.

KRUPP INDUSTRIES.

A SUMMARY OF THEIR MAGNITUDE TAKEN FROM AN ANNUAL REPORT—WORKS EMPLOYING 46,679 MEN.

From the 1899 report of the Krupp steel plant at Essen some very interesting information is obtained regarding the magnitude and capacity of the Krupp organization. During the year 1899 the firm of Krupp comprised the steel plant at Essen; the steel works at Annen, Westphalia (formerly F. Asthover & Co.); the Gruson plant at Magdeburg-Buckau; the blast furnaces near Duisburg, Neuweid, Engers and Rheinhausen (the latter possessing three furnaces, each of 230 tons per diem capacity); a plant near Sayn; four coal mines (viz., Hannover shafts 1, 2, 3 and 4, and the Salzer and Neuack shafts), besides part ownership in various other mines; more than 500 iron ore properties in Germany, of which eleven are deep shafts fitted with mechanical equipment; various deposits near Bilbao, Spain; shooting grounds near Meppen, 16.8 km. in length, with an actual firing distance of 24 km.; three ocean steamers, several stone quarries and clay and sand deposits, besides the control and operation of the Schiffs & Maschinenbau Actiengesellschaft "Germania," at Berlin.

The principal articles of manufacture at Essen are ordnance, ammunition, gun barrels, armor plate for all protected parts of war ships, as well as for fortifications, iron and ship building material, machine parts of every sort, rails, iron and steel plates, rolls, tool steel, etc. The Essen plant is divided into the following departments: Two Bessemer works, containing altogether fifteen converters; four Martin works, two steel casting works, puddle works, crucible steel plant, welding mill, foundries, works for casting guns and brass, annealing shops, hardening halls, crucible chambers, block rolling mill, rail rolling mill, plate mill, bolt and spring steel works, spring machine shop, hydraulic press plant and armor plate rolling mill, hammer works, wheel foundry, tire rolling mill, boiler shops, field railway construction shop, mechanical workshops (with file factory), four repair shops, railway machine shops, gun and ammunition shops, testing laboratory, two chemical laboratories, one physico-chemical testing laboratory, boiler house, electrical plant, gas works with one plain and two telescope gas tanks, holding respectively 5,700, 17,500 and 37,500, altogether 60,700 c. m.; water works with three separate sources of supply, factory for fire brick and briquettes, brick kiln, lithographic and photographic establishments, together with a book bindery, freight office, telegraph, telephone, fire and safety departments and food supply stores.

In the steel plant at Essen there were in operation in 1899 1,700 different furnaces, forges, etc.; 400 different machine and workmen's tools; 132 steam hammers from 100 to 50,000 kg. falling power (in all 269,125 kg.); thirty hydraulic presses, two of 5,000 tons each, one of 2,000 and one of 1,200 tons; 316 steam boilers, 497 engines from 2 to 3,500 H.P. (altogether 41,213 H.P.), 558 cranes from 400 to 150,000 kg. carrying power (altogether 5,963,150 kg.). At the mines an average of 1,877 tons constituted the daily output of ore, while the production of coal in the mines proper averaged 3,738 tons per diem. Coal and coke were consumed at the steel plant to the extent of 952,365 tons. The total consumption at the remaining works was 622,118 tons, or in all 1,570,483 tons—5,000 tons daily. The consumption of water at the steel plant amounted to 15,018,156 c. m., or as much as is required by the city of Frankfurt-on-the-Main. The combined length of the water pipe was 171.59 km., that in the buildings 106.48 km. The consumption of gas for lighting purposes amounted to 18,836,050 c. m. (the consumption of the city of Leipsic for the same period was 21,931,140), the same supplying 2,596 street lights and 41,745 lights in the works.

The electrical plant of the steel works possesses three engine rooms with six distributing stations, 26.85 km. of underground and 90 km. of overground cable for lighting, and feeds 877 arc lights, 6,724 small lights and 179 electro motors. As regards means of communication Krupp's plant is singularly well supplied. A standard gauge railway net is in direct track connection with the Essen Railway Station, North Essen and Berge-Borbeck. Communication with these three stations is effected daily by fifty trains. In all the net comprises 58 km. of track, sixteen locomotives and 707 cars; furthermore there is a narrow gauge railway net with 44 km. of track, twenty-six locomotives and 1,209 cars. Krupp's telegraphic net contains thirty-one stations with fifty-eight Morse apparatus and 81 km. of wires. It connects with the Imperial Telegraph Office in Essen, and the year's business between the factory and the city amounted to no less than 22,787 sent and received dispatches. The long distance telephone possesses 328 stations with 335 apparatus and 320 km. of wires. The daily calls average 900 to 1,000. In the testing and trial rooms 173,209 tests were made, of which 87,626 were breakage and 83,262 bending tests.

The fire department employs ninety-five men. The works proper contain 347 and the outbuildings 121 hydrants, while in addition there are thirty-five extra water sources for use in case of necessity, eighty-two electric fire alarms, besides the 330 odd telephone call stations.

The laborers live in what are called colonies, a group of settlements comprising Baumhof, Nordhof, Westend, Kronenberg, Friedrichshof, Schederhof, Alfredshof and Altenhof, with 4,210 family dwellings. The total number of workingmen's dwellings erected by the Krupps up to April 1, 1900, was 4,853. There are, furthermore, one hospital, two barracks for epidemic cases, one convalescent home, one workmen's eating house, two lodging houses for unmarried men, one club house for clerks, one club house for works foremen, one housekeeping school for adults, one industrial school for adults, three industrial schools for children, one library, etc.

According to the census of April 1, 1900, the total number of persons employed at the Krupp Works, including 3,559 office employes, was 46,679, of this number 27,462 are employed at Essen, 3,475 at the Gruson works in Buckau, 345 at the Germania in Berlin and Kiel, 6,164 in the coal mines, 6,128 at the ore mines, the shooting grounds and other places.

The report is confirmed at the offices of the International Navigation Co. that the steamship Paris is to be renamed Philadelphia. This is in keeping with the decision of the company to rename all of its ships after American cities. The hull of the vessel has been practically rebuilt and she will be equipped with new engines and boilers, capable of developing 20,000 H.P. It is expected that the vessel will be launched Feb. 1. next.

BUFFALO'S NEW STEEL WORKS.

Buffalo, Aug. 21.—I was never more impressed with the adage that large bodies move slow than when I took a trip this afternoon to the site of the Buffalo steel plant, which is to be erected in good time by the Lackawanna Iron & Steel Co., now of Scranton, but which is expected to move to the new base of operations as soon as needed, and bring all apparatus and other things that pertain to the old plant with them so far as possible. The present working force is now employed on what is known as Stony Point ridge, which is on the lake shore at the southern end of the long breakwater, a little more than four miles from Ellicott Square in the city.

What I found was not exactly a steel plant, nor really anything else that as yet looks like one, though there is plenty of indication, as a mining expert would say, that there will 'ere long be something of the sort found on the premises. To the non-professional mind it is always a mystery why scientific operations progress so slowly, and there is much aptness in the saying that while the man of science is getting the plan ready for an undertaking the unscientific man will complete the entire work. This is, of course, a general saying and is repeated here merely to ease the public mind in the matter, for it is not in my design or desire to make it appear that there is any such delay on preliminaries in the present case. Still there is no structure at Stony Point yet to exhibit as a beginning of the new steel plant, the outline of which was made public seventeen months ago. There is merely a shanty that is used for a machine shop and general headquarters, outside of the cottage that is used by the engineers. A locomotive is operating a work train on a narrow-gauge track and a gang of men is cutting off about 3 ft. of the top of the ridge to use for filling in the lowland side, where are in evidence the concrete piers for a new building. Further on towards the lake a building is rising above its foundations and ought to be making a showing above ground soon. There are also concrete lines up to the top of the denuded earth for a third and apparently very large building. I am told that the wooden building will soon give way to a brick one that will be large enough to be built over it.

All these operations are just within the shelter of the new harbor breakwater, which, somehow, without ever guessing it, the city managed to have built just in time to make these operations possible. The company is also bringing in a pipe line from the lake for a larger water supply and ought, in a short time, to have the earlier structures far enough along to satisfy the eye of the uninitiated. Still the company is making no secret that it is not building to satisfy the eye of anybody and it will make no false motions or any other motions whatever just to please people other than those interested. This is a business venture, and that is all. The public must wait. Not only is this true, but the company declines to exhibit any plans so that outsiders may learn what is to be done in the near future. Business is not done that way. Some of the buildings to be erected first are under contract. They are to be machine shops, boiler houses and the like preliminary structures, including accommodations for the men. There will be no furnaces yet and it is stated semi-officially that there is not likely to be any ore reduced on the premises this year, and it is quite likely that no canals will be dug for the purpose of bringing in ore to be placed on storage for use before the next season opens.

I am told that the company will locate its offices on the plant and that the great expanse of land it has bought, extending, "as far as you can see" southward from the ridge as one of the workmen expressed it today, is to be used up gradually as material in the form of slag and other refuse comes to hand to fill it in with. The working force is quite large, having numbered 275 laborers at times, though it varies a good deal.

The possibilities of the site, as presented to even the most unprofessional eye, are practically boundless. The ridge runs directly inland from Stony Point—all well protected by the breakwater. It is high enough and long enough to furnish the site for a large number of buildings. Here is an easy place of beginning, while all the rest of the great property is a sort of marsh so nearly down to the lake level that canals can be extended all over it. Ore from the mines can be unloaded at the furnace doors and the finished product can be reloaded into boats for tidewater or in moderate-sized cargoes for any part of the world. There will be a railroad in operation on the site in a short time, which will bring fuel or anything else to be had best from inland points. The road extends to the Buffalo freight system at the northern end and there is a trolley line from Buffalo almost to the present operations.

JOHN CHAMBERLAIN.

ORDERS FOR HEAVY MACHINERY.

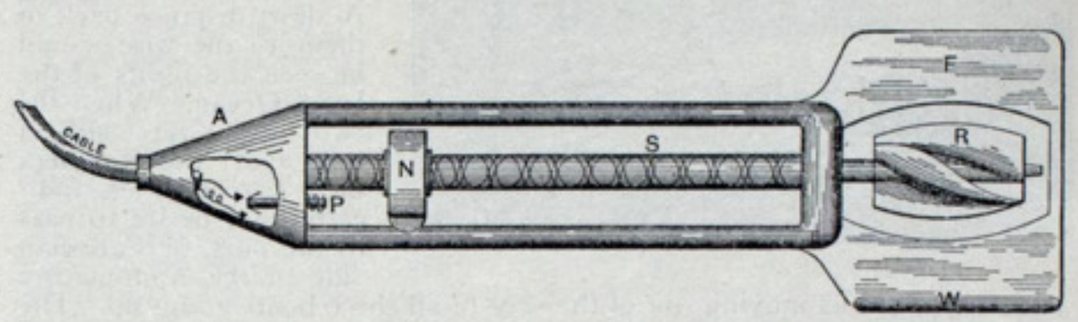
The Cleveland Punch & Shear Works Co. has let contracts for improvements that will greatly increase the capacity of its plant. This has become necessary by reason of increased business, and the growing demand for heavy tools of the kind made by this company. Among recent shipments from these works are the following: Bending and straightening machine for the William R. Trigg Co.; 54-in. throat punch for the Hamler Boiler & Tank Co.; 6-ft. arm radial drill for the Charleston Boiler & Foundry Co.; 8-ft. arm radial drill for the Compagnie Internationale d' Electricite, Liege, Belgium; 36-in. throat punch for the Patterson Supply Co. of Cleveland; 12-ft. arm radial drill for the Carnegie Steel Co.; 10-in. throat horizontal punch for the Joliet Bridge & Iron Co.; 18-in. beam coping punch for the Easton Foundry & Machine Co.; 36-in. throat punch for the Belmont Iron Works; "T" horizontal punch for the Phoenix Iron Works; and a 12-ft. arm radial drill and 36-in. throat punch for the Hawley Down Draft Furnace Co.

LARGE FORGINGS.

Among the orders recently booked by the Bethlehem Steel Co. are spare propeller shafts for the steamers Ponce and San Juan of the New York & Porto Rico line, which are being furnished to the Harlan & Hollingsworth Co. of Wilmington, Del. The Bethlehem company is also supplying eight forged hollow shafts of fluid-compressed open hearth steel for use in Cuban sugar mills, and in addition to these there are also under way a large number of gun barrels for the Winchester Repeating Arms Co. and Colt's Patent Fire Arms Co. These latter forgings are to be made of Bethlehem nickel steel, which is peculiarly adapted to the purpose on account of its ability to withstand severe strains.

McGRAY ELECTRIC INDICATING LOG.

Capt. A. N. McGray of Boston, Mass., is the inventor of an electric log which is said to have been at fault less than one-half of one per cent. in tests over courses of about 50 miles. The trials were made on the U. S. S. Porter, a high speed torpedo boat. It is well known, of course, that the great difficulty with logs of the rotator kind, which are generally in use, is that the line gets slack and the motion of the rotator is irregular and jerky, especially when a sea is running and the line loosens and tightens. The McGray log, as will be noted by the illustration, consists of a rotator and contact maker towed astern by a double conductor cable which is connected with a battery on board the vessel, and an indicating apparatus, which is a simple revolution counter moved forward step by step by an electromagnet. It registers in hundreds, tens, units and twentieths of nautical miles. Naturally, as many recording instruments as may be desired can be installed in different parts of the vessel and all connected together, provided the battery is strong enough. The rotator R is mounted in the frame of the apparatus and constantly turns the



double-thread screw S. On this screw runs the nut N which, as the rotator revolves, constantly runs forward and backward from end to end of the frame. The rotator is mounted in the frame F, which is equipped with four fins, one of which is weighted at the bottom by the weight W, the function of this being to prevent the whole apparatus from turning round in the water. All of the parts described run exposed in the water, but the front end of the log carries a conical compartment A, which is water tight. In this are the electrical contacts, which are operated by the push-rod P every time the nut moves up to the forward end of the frame. In this way one contact is made every time the rotator turns round a definite number of revolutions, corresponding to a certain distance traversed by the ship. It is said that on the tests made by the Porter the indications on the log were exceedingly accurate, in a trial run of 44 miles made off Newport its indications having been at fault only one-half of one per cent. It is understood that the log has been installed on the United States cruiser New York for an extended test.

AMERICAN-HAWAIIAN STEAMSHIP SERVICE.

The American-Hawaiian Steamship Co. has sent out a circular announcing that it will begin its service to Pacific coast ports and the Hawaiian islands via the Straits of Magellan with the dispatching of the steamship American on Sept. 1. While this announcement in itself contains only the bare information that a new steamship service on the western coast of this country and to the Hawaiian islands has been established, it brings news of much importance to the general trade. Besides the American there will be five other boats added to the line, which will make it one of the most important in the shipping trade among the ports mentioned. First, because its steamers are much larger than the ordinary boats engaged in the trade, and second, because it establishes a permanent shipping line from New York to the Pacific coast ports and the Hawaiian islands.

The six boats to engage in the service are the American, Hawaiian, Oregonian, Californian, Alaskan and Arizonian. The Californian was launched on May 12, and has been engaged in the transport service of the United States between San Francisco and Honolulu. The American, which will make the initial trip Sept. 1, was launched July 14. The boat was built at Roach's ship yard, Chester, Pa. She is 435 ft. over all, 56 ft. beam, 33 ft. deep, and will carry 8,500 tons, dead weight, at a maximum speed of about 11 knots. Her sister boats are the Hawaiian and the Oregonian. These three are single screw steamers, built with what is known as the well deck, and are the largest of their kind in the world. The Hawaiian will be ready for launching about the last of September, and the Oregonian will be taken from the stocks about the latter part of November. Both of these ships are being built at Roach's ship yard. The Alaskan and Arizonian are larger than the other boats, having a capacity of 12,000 tons with twin screws, quadruple expansion engines and shelter decks. They are rated to be the highest type of full-powered American-built cargo steamers extant. The Alaskan and Arizonian will not be completed before next year. The former will be launched probably in the spring and the latter early in the fall. Another important feature of the line is that its ships will be dispatched monthly. It will enter strongly into competition with the many other lines on the western coast, of which the following may be named: Grace & Co., Pacific Steamship Navigation Co., Kosmos line and the Hamburg-American line. The addition of the new service of the American-Hawaiian Steamship Co. will be of great benefit to the trade on the western coast, in that it will tend to cause a material reduction in freight tariffs, which at present is the all-absorbing topic of discussion with merchants on the western coast. The new line will also touch some ports of Chili and may possibly develop a trade among the Western South American ports. The general agents for the company in New York are Flint, Dearborn & Co., at No. 11 Broadway.

The Union Steam Pump Co., Battle Creek, Mich., has announced its intention of erecting new buildings in 1901. One will be a three-story and the other a power house.

The thirty-fourth annual encampment of the G. A. R. at Chicago. For this occasion the Nickel Plate road will sell tickets at one cent a mile travelled on Aug. 25 to 29, inclusive, good returning until Aug. 31 inclusive, or by deposit until Sept. 30 inclusive, on any one of our peerless trio of daily express trains where scheduled to stop. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 150, Aug. 29

TRAMPS OF THE OCEAN.

There are many grades of "tramp," or cargo steamships. They are built solely for the purpose of transporting merchandise, and range from the magnificent cargo carriers of 10,000 or 12,000 tons owned by big lines and designed as auxiliaries to their regular passenger service, these being the aristocracy of trampdom, down to the small, cheaply built, owned-by-hardly-anybody-knows-who steamers which look more like exaggerated steam barges than anything else. The principal ports of origin of the tramps are on the northeast coast, says a writer in the London Mail. From the Tyne, the Tees and the Wear they come in fleets, and on the banks of those murky rivers hard-headed ship builders and engineers are forever revolving the problem of how to carry the largest cargo at the quickest rate upon the smallest expenditure of coal. And the strides that have been made in this direction within the last twenty-five years are enormous. A statistical presentment of them would hardly appeal to the average reader, but to the thoughtful student of economics it would be astounding. Yet this development of cheap sea carriage is of the most profound interest to all of us living in the seagirt islands if we could but be brought to think of it a little. It suggests another and no less truthful definition of the "tramp steamer"—one of the arteries by which the life of Britain is maintained. These wall-sided, abrupt-ended tanks pour into our ports continually the enormous mass of food which makes us the best-fed nation of Europe. Bread and meat from all over the world is piled by them upon our groaning wharves, whence it melts away more speedily than snow in summer to feed our teeming populations.

And thus it is that the manning of these tramps becomes a matter of prime national importance, albeit one that it is a most toilsome process in which to get the ordinary citizen to take any interest. Who and what are the men to whom the carriage of these vital elements of our national life are intrusted? Being the greatest maritime nation upon earth, and claiming the proud title of ruler of the waves, of course these sources of supply are conducted by the very flower of British seamen; in fact, the sailor that nautical fiction has led us to adore. Well, if we think about it at all, which, strangely enough, is not likely to be the case, that is, no doubt, the opinion we should form, and without further inquiry go comfortably about our business. But some rude hand mercifully arrests us and says: "Oh, you think so, do you? Well, go down to the shipping offices, the places where sailors are engaged, and see." And having other matters to attend to we don't go, and consequently we don't know, but in the typically British fashion we let things drift, expecting vaguely that all will come right somehow. Well, if you will not go down in the flesh, have it done for you by proxy, lie back in your garden seat, on the bus or tram going to business in the morning and read of some one else's visit for your benefit. We will take a tramp that will carry, say, 2,000 tons, going to the Black Sea, for grain. She lies in the Millwall docks, and is advertised to sail Monday (this being Thursday.) For the last day or two quaint, foreign-looking men have been slouching on board, and, diffidently approaching the worried-looking chief officer, have tendered him certain oblong pieces of thin paper, their certificates of discharge from the last ship.

It is an even chance that he himself is a foreigner, the number of foreign officers in our mercantile marine being very large, and if so be sure that he will be eager to accept the discharges of his own countrymen as they present themselves. But even if he be a Briton the probability is that he will not hesitate to take the discharges of as many foreigners as offer: "They're such a quiet lot o' chaps, y' know," he would say. This accepting of discharges means that on the day appointed for signing the articles, that is, engaging the crew, those men who have had their discharges accepted will present themselves at the shipping offices, their names will be called out, they will go in and sign, and become the crew of that ship for the next voyage. Sometimes, however, the mate, being the crusty old Englishman unwilling to be bothered with collecting his crew beforehand, or owing to lack of applicants, the skipper will come down to the office unprovided with names. Then, accompanied by an official, he appears in the doorway and the official shouts, "Six A. B.'s wanted for the Pickford." Then you may see a strange sight. A rush of wild-looking men at the speaker, each with his right hand brandishing his discharge, ready to go anywhere on the round earth's surface if only he can get the chance. And the majority of these strugglers will be your own countrymen. Very occasionally they go strolling around the docks ship hunting and leaving their discharges, but they prefer to hang around the shipping offices and take pot luck. Often the cry for six or any other number of A. B.'s is a false one, as there are several hands already engaged. The skipper wants to get his pick of men. The net result is usually that out of a crew of from six to ten three-fourths will be foreigners of sorts, and if she be a lucky ship a couple of them will be sailormen as distinguished from tramp laborers. For, as sailors will tell you, sailors are not wanted nowadays; so long as a man can handle a trolley, a shovel and a soogeemoogee swab, that is all that is required of him, unless by some hapless accident (for him) he gets on board a sailing ship.

Then comes the shipping of the "black gang." Most likely the engineer will have looked after their selection, and as they are really the most important men in the ship they are as carefully chosen as is possible. They are mostly our own countrymen, but they are a hard lot. Poor chaps, it would be a crime to say a word against them, remembering what their life is, but they themselves would be the first to own that they were a rough set. Few indeed are the foreigners that elbow them out of their jobs; they know better. So that when the Pickford's crew is complete she will have probably among the deck hands a couple of Greeks, an Italian, two or three Scandinavians, a negro and a Briton, one of these being a bo'sun and lamp trimmer. The engineer's crew, on the other hand, will probably be three parts Irish, those hard-working, improvident, careless fellows who do so much of our hardest work. There will be three engineers, every one of them home-born, for in this particular branch of seafaring we are not only still able to supply all our own ships, but to provide a goodly number of foreign vessels with engineers as well, which is something to be thankful for. But the officers—well, as I said before, it is an even chance that some of them will be either Germans or Scandinavians, and it is not unlikely that the master will also speak English with a foreign accent. So that we have the curious spectacle of the Briton being the "under dog," the foreigner rejoicing "topside."

Of course, the question will be asked why are these things so? Alas, the answer must needs be too lengthy for space at disposal, that is to be satisfactory. But very roughly, it is that the condition of life on board tramp steamers is not up to the standard of comfort we have taught our workers to expect. So the British-bred boy tries the sea life and finds it not good enough. He steps out and allows the hungry, down-trodden foreigner to step in. Only the pity of it is that the latter's early acquired hatred of the country which pays him better, feeds him better, and treats him better than ever he has been before does not diminish but rather increases.

ENLARGED PORTHOLES FOR PASSENGER SHIPS.

(From the Engineer, London.)

The lamentable loss of life and the harrowing details of the sufferings in the terrible harbor fire in New York have led many correspondents in the daily press to urge the fitting of enlarged portholes in the sides of passenger ships. From the accounts furnished to the American papers by those engaged in the work of rescuing people from the burning ships, it appears that but for the small size of the portholes in the ships' sides the loss of life would have been comparatively insignificant. Rear Admiral Melville of the United States navy, who did good service in the work of rescue, is said to have stated that "had the portholes been a few inches wider every person would have escaped." This same authority is said to have denounced the portholes on the Saale as "abominations!" Other comments on the catastrophe run: "The worst feature of the whole affair was the ghastly mistake that had been made in constructing the portholes of the unfortunate vessels too small to admit the passage of a human body."

All this is, of course, quite natural and excusable in the circumstances, but it betokens an increasing disregard for, or lack of appreciation of the purposes ordinarily to be served by portholes, and the difficulties and objections there are in the way of departing from the accepted practice in the matter. The present size of porthole satisfies, in the main, all ordinary requirements as to light and ventilation for state rooms, at the same time that other conflicting conditions are met. Two of the latter are the maintenance of longitudinal strength in the upper works of passenger ships and the minimizing of parts liable to failure in resisting the blows of the sea. Of course, if the contingency of fire, remote and unique as in the case of that at New York, must be positively provided for, then the inventive skill of our ship builders, and the thoroughness of our ship owners will no doubt be found equal to the occasion. Already, and for many years past, where stateroom airiness and ventilation are very essential requirements—as in the case of passenger vessels constantly doing service in very hot climates—large square ports, capable of passing the average man or woman have long been in vogue. The lids or covers of these ports are of staunch and solid hardwood, combined with plating, hinging outwards, and through these one or more round lights of the ordinary dimensions and strength are fitted. In stormy weather the square port lid is securely fastened by nuts, screws and rods inside, and only the opening round light is available. These square ports, 17 in. by 13 in., or thereabout, are only fitted, as a rule, through the sides of deck erections or superstructures, such as poops, bridge-houses, etc., comparatively high above water, and offer fewer objections than similar ports cut through the shell in the region of the main sheer would do. The compensation in sectional area of material that would be required for these big perforations through such a vital part of the structure would be difficult, if not impossible of arrangement, and their presence would be a continued element of danger in stormy seas, if not in harbor as well. The extra cost of compensating for them, and of their fitting and elaborate means of fastening, are alone considerations calculated to discourage ship owners from adopting them.

It has been maintained in some of the correspondence on this subject that there may be various causes, besides fire, which would make the upper deck of vessels untenable—a mutiny, say, or pirates boarding in some southern ocean. If every contingency, however remote, is to be provided for, then ship owners might as well instance the facility the enlarged porthole would afford to passengers inclined to suicide, and to thieving "water rats" for entering and leaving staterooms when vessels are in harbor. Doubtless the Hoboken catastrophe will not be without its influence in securing larger portholes, where these can safely and conveniently be fitted without impairing other and generally more requisite arrangements, but in view of the uninformed and hysterical—though well-intentioned—clamor for enlarged portholes, and the stigmatizing as "abominations" of those ordinarily provided, it may be just as well to have all the facts put clearly before the public.

A BRITISH VIEW OF THE COAL QUESTION.

It seems to be generally supposed, and the belief finds frequent expression in the papers, that American coal for steam, manufacturing, and household purposes will be imported into this country in large quantities should prices here advance any further, and that it is this consideration which prevents our coal owners from demanding higher than current rates. Those who write in this strain do not realize the true nature of the situation. If the United States was a free trade country we should have been receiving its coal largely for some time; but being a protectionist country, levying heavy duties on its imports, it shuts out trade from this side by cargo-steamers, with the result that vessels have to proceed westwards in ballast and practically to charge double freight on their homeward employment. This is principally why coal cannot be sent here at a profit from the states, even at the exceptionally high prices now ruling. If boats were able to get cargoes outwards, they could afford to accept lower freights homewards than they now have to hold out for; and coal owners in the states could see their way to ship largely to this country. Those coal proprietors have at present another difficulty to face. They have no settled market in which to find tonnage, because steamers are mostly fixed for homeward employment before they leave here or before they arrive out.—Fair Play, London.

The Hamburg-American Steamship Co. is building extensive docks and warehouses at Cuxhaven, at the mouth of the river Elbe, and are laying out a colony for their workmen. The project will cost many millions. When completed the point will be the headquarters of the company's large fleet of steamers.

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The long heralded tour of the committee on rivers and harbors of the house of representatives and of the committee on commerce of the senate, though to tell the truth, only one member of the last named committee took the trip, is at an end. The party disbanded in Chicago on Tuesday of this week and found their several ways home to think about it. It is a fortunate thing that the chairman of the committee on rivers and harbors is a lake man. The members of the committee were wined and dined and then shot through the various ports as from a catapault. They had about as much time to assimilate what they saw as though they made the trip astride a cannonball. Everywhere they went they were surrounded by committees on reception which were almost regimental in size; brass bands led the march through rolling mills and added their brazen notes to the general din; every craft in the harbor that had a pound of steam up blew itself black in the face in honor of the committee, and meanwhile the members were making their review at full tilt. The result is that they have a realistic and undying comprehension of the magnitude of the lakes and its commerce; but no details whatever. It is for this very reason that it is rare good fortune that a lake man is at the head of the committee. The average member did not bother himself much about details. He left all that to Burton. The lake trip will doubtless be far reaching in its results. It has served to give the inland member an impressionistic picture of lake commerce, which is all the more striking owing to its lack of detail. The lake business is so vast that it bewilders, and it comes upon him who takes the trip so suddenly as to completely overwhelm.

The United States has become an expert nation and the government must shortly cast about for other means of revenue than tariff duties. Setting aside the enormous sum which its ships earn for carrying the goods, the export trade of the United States is greater than that of Great Britain. True the balance of dollars is still with Great Britain though the greater export is with us. Great Britain carries more than 50 per cent. of the world's commerce, and it is a sale just as much as the export of an article is a sale. The United States, from an agricultural and industrial standpoint, was never in a more prosperous condition than it is today. The total commerce of the year surpasses by $319,729,250 that of any preceding year, and for the first time exceeds $2,000,000,000. Even Reed little dreamed of what he was saying when he declared the United States to be a billion dollar country. It is a billion dollar country in more ways than one. Manufacturers' materials were more freely imported than ever before and exported as a finished product. The exports to Spain are greater than they were before the Spanish-American war. In depriving Spain of her colonies a permanent good seems to have been done, for it has caused Spain to vastly improve her domestic conditions. It has served to stimulate her internal industries. During the past year our exports have been more widely distributed than ever before. They have reached every country. The orient shows a respectable gain. But of all this far-flung commerce an infinitesimal per cent. of it went abroad in an American bottom. The profit in the carriage of all these goods went to Great Britain. This profit was sufficient, notwithstanding our enormous exports, to turn the tide in her favor. England made more money out of her export trade than we did, though in the bulk of it she plays a second part.

The navy department is in receipt of an offer from a number of Chicago citizens to present the ship's bell from the old brick battleship Illinois to the new Illinois, now approaching completion at Newport News. The Illinois, it will be recollected, was one of the lake front attractions at the Chicago world's fair, and, being the first battleship of that name, albeit she never saw any active service, it was considered appropriate that her bell should be transferred to the new battleship of the same name. The offer will be accepted and arrangements made for appropriate ceremonies when the presentation takes place.

Germany proposes to pay an average price of $5,600,000 for each of the four battleships ordered under the navy extension scheme. Krupp, Schichau and the Vulcan works will each build one, while the fourth will be built in the imperial yards. This is considerably more than is paid in the United States for this type of ship. It is in the proportion of $475 per ton for a German ship and $378 a ton for a British ship. In other words a British ship of 15,000 tons displacement costs no more than a German ship of 11,800 tons.

SHIP BUILDING IN JAPAN.

One of our consuls in England writes that the British public is very much surprised to hear that 13,000 tons of steamships are now building in Japan for European account. This new departure will certainly attract much attention in shipping circles. British ship yards have profited much in recent years from the rapid development of Japan's merchant marine; but this year only half as much tonnage is building in British yards for Japan as the Japanese yards are turning out on European orders, and Japan is building a third as much tonnage of steamships for Europe as was in course of construction in all the ship yards of France during the first quarter of this year. The chief ship building yards of Japan are those of the Mitsu Bishi Co. of Nagasaki, which a while ago launched a merchant steamship, built for the Japan Mail Steamship Co., of 11,600 tons displacement and with a freight capacity of 7,150 tons. This is the largest steamship ever launched outside of American and European waters. The yards are arranged for vessels up to 500 ft. in length and four may be on the stocks at one time. About 2,000 men are employed in the yards. Nagasaki is the chief center of Japan's remarkable industrial progress in recent years and it is not strange that the ship building company has found it necessary gradually to advance the pay of its employes. The growth of industries in Nagasaki has so largely increased the population that the cost of rent, fuel, clothing and food at that port has also increased.

The bounty which Japan pays under the law for the encouragement of ship building has undoubtedly stimulated the business and has probably tended also to improve the quality of the output, as the law requires thoroughly good workmanship. No vessel that fails to meet the required standards receives any bounty. It was said in 1898 that not many vessels built up to that time had fulfilled the requirements of the law. As a few European orders have now come to the Japanese yards it seems likely that improvement is the order of the day. The way the Japanese rushed into the ocean carriage trade with lines of their own big steamships to Europe, America and Australia, made older and more experienced men in the transportation business rub their eyes. Their competitors were well established and sometimes it has been hard for the Japanese to pick up cargoes at the foreign end of their lines. They have been known to fill up at an American port, for example, with railroad sleepers for Shanghai in lieu of more profitable freight. The liberal mileage subsidy their government offers, has, however, helped them out; but some shipping enterprises in Japan were nipped in the bud by the unfavorable balance sheets that the pioneer lines had to show for a while.—New York Sun.

IRON THE RULING INDUSTRY.

CONTROL PRICES OF IRON AND WE WILL HAVE A REMEDY AGAINST HARD TIMES—A THEORY ADVANCED BY MR. GEO. H HULL.

(From the Literary Digest.)

Jay Gould, it has been said, used to consider the price of iron a financial barometer by which he forecast the prices of other commodities. When the price of iron went up, he expected to see other prices go up; and when iron went down, he expected to see the rest of the market to follow, and it is said that he rarely found this method of forecasting prices to fail. The present downward course of the price of iron, therefore, will be watched with considerable interest to see if it is the forerunner of a general depression of prices. Thus far, although the decline in iron has now been in progress for the greater part of a year, it has not been accompanied by any notable decline in the prices of other staple products.

George H. Hull, who has been in the iron business for years, and is now president of the American Pig Iron Storage Warrant Co., has come to the conclusion, after considerable investigation, that it is the high price of iron that causes the subsequent low price, and, indeed, that it causes all the other low prices that make an industrial depression, or "hard times." His theory (as told by him in The Engineering Magazine for August) is, in a word, that a very high price for iron destroys the profit in all the many businesses where iron is used, so that the builders and manufacturers limit or stop production, workingmen are thrown out of employment, and the "hard times" begin. To illustrate, he says:

"In the little community in which I reside, there were twenty-three houses built in 1899, all of which were contracted for before the advance in prices. This kept the workers employed all the year. A large number of residences were planned for 1900, but when the bids for these came in, it was found that a residence which would have cost $100,000 in 1899 would cost $160,000 in 1900. The result has been that as bids have come in the projected buildings have been given up; and, as the houses contracted for at low prices have been completed, the workmen have departed. If this be an isolated instance and these workmen are finding employment elsewhere, then it signifies little. But if this be typical of what has been taking place throughout the country and they are not finding other employment, then we have already made several months' progress toward industrial depression."

Not only building operations, but almost every other branch of modern industry, depends more or less upon the price of iron. Says Mr. Hull:

"Iron is acknowledged to be the foundation on which the modern industrial system rests. If that system is disturbed, it is most natural to look to the foundation for the cause of the disturbance. If one would appreciate how thoroughly the entire industrial system depends upon iron, let him imagine what the world would be today without it—what it would be if we depended upon wood, stone, copper and tin for our implements of agriculture, tools, machinery, vehicles of transportation on land and sea, the vast network of rails on the surface, and the pipes which carry water, gas, etc., under the surface. What proportion of these could have existed without it? It matters little what its price is, provided that price is stable. The industries of the nation depend upon the actions of an aggregation of individuals. When the individual considers an expenditure for a permanent improvement, and finds that improvement will cost 50 per cent. to 100 per cent. more than it would have done a year before, or is likely to do a year later, he acts, and that action is almost invariably a postponement of that improvement. This, in a nutshell, is the reason that industrial depressions follow an abnormal advance."

Not content with the plausibility of his theory, Mr. Hull has ran-

sacked history to see what relation the price of pig iron has held to hard times in the past seventy-five years; and from the American Almanac he has compiled the following table, showing that high prices for pig-iron have always been followed by industrial depressions in the United States, Great Britain, France, Belgium and Germany, the principal iron-using countries of the world. Here is the table:

PRICES OF SCOTCH PIG IRON IN NEW YORK.

	Lowest.	Highest.	Year.	
Low, High	35	75	1825	114 per cent. advance.
Depression	50	70	1826	
	50	55	1827	
	50	55	1828	
	40	55	1829	
	40	50	1830	
	40	47.50	1831	
	40	47.50	1832	
	37.50	47.50	1833	
Low	37.50	48	1834	
	38	42.50	1835	
High	38	62 50	1836	
Depression	40	70	1837	86 per cent. advance.
	37.50	55	1838	
	37.50	45	1839	
	32.50	40	1840	
	32	37.50	1841	
	23.50	35	1842	
Low	22.50	32	1843	
	30	35	1844	
High	30	52.50	1845	133 per cent. advance.
	35	42.50	1846	
Depression	30	42.50	1847	
	25	37.50	1848	
	22.50	27.50	1849	
	21	24	1850	
	19	25	1851	
Low	19	31	1852	
	28.50	38	1853	
High	32	42.50	1854	
	26.50	37	1855	123 per cent. advance.
	29	37	1856	
Depression	28	37.50	1857	
	22	27	1858	
	22	31.50	1859	
	20.50	27	1860	
Low	20	24.50	1861	
	21	33	1862	
	32.50	45	1863	
High	43	80	1864	300 per cent. advance.
	40	55	1865	(Depreciated currency.)
	42	55	1866	
Depression	38	49	1867	
	35	45.75	1868	
	34.50	45	1869	
	31	37	1870	
Low	30	39	1871	
High	33.50	61	1872	103 per cent. advance.
Depression	37	52	1873	
	33	45	1874	
	29	41	1875	
	27.50	34	1876	
	25	28	1877	
	21.50	26.50	1878	
Low	19	30.50	1879	
High	21	35	1880	84 per cent. advance.
	22	26	1881	
Depression	23	26.50	1882	

Many will ask why this table does not include the panic of 1893. Mr. Hull explains that the 1893 storm was not an "industrial depression," which is a long-lived calamity, but merely a "panic," from which the country had recovered by 1895. We have had no real industrial depression, according to his view, since 1882. Since hard times, then, are caused by advances in the prices of iron, the remedy for hard times would be some method for controlling the price. This might be done by carrying a large supply of iron on hand, so that when the price showed an upward tendency, the reserve stock would come upon the market and keep the price normal. "Thus, of lumber," says Mr. Hull, "two or three years' stock is always carried, and brick, stone and coal can always be adequately and quickly supplied by simply increasing the workers in brick yards, stone quarries and coal mines. But of iron we have carried for the last ten years less than twenty-three days' production, and it takes a year to build a furnace. Consequently, in each period of revival in the industries of the world, iron consumers became alarmed through fear that there would not be enough to supply all demands; each buyer made an effort to contract for sufficient to supply his needs, and this being impossible to accomplish prices advanced rapidly until they reached 80 to 100 per cent. above cost." He goes on:

"The only possible way to bring iron under proper control is to accumulate, in each of the iron-producing countries of the world, a stock of pig iron equal to several months' production. It will not suffice to do this in one country only. The demand from the others would carry its price up with theirs. Each country must accumulate an adequate reserve stock of its own. If this be done during the next few years, there will be no more periods of boom and no more periods of industrial depression, except such short temporary interruptions as may come from financial panics; in time, they, too, may be understood and prevented. If the manufacturers of building materials would, at this juncture, voluntarily and promptly put down prices to within 10 per cent. of normal figures, which is as low, also, as they should ever have gone, even in the periods of most marked depression, it would revive a large number of the building enterprises which are now postponed or abandoned, and a prolonged industrial depression might even at this late date be averted. If, on the other hand, prices are held up, until sales are forced by the accumulation of excessive stocks made at high cost, then heavy losses and failures will occur, confidence will be lost, and no amount of reduction will revive the postponed enterprises, until the iron-producing nations have passed through just such another industrial depression as has heretofore followed each abnormal advance in the price of iron."

Mr. Hull predicts a rosy future for the manufacturing nations when the erratic price of iron shall no more upset prosperity every few years. He concludes: "There is a wonderful future for the iron business the day these violent fluctuations in its price are ended. The annual consumption of iron in the United States is growing with a cumulative force. Fifty years ago it was 100 pounds per capita, two years ago 300 pounds, and last year 400 pounds per capita. Within twenty-five years it should be 1,000 pounds. Not one-twentieth of the inhabitants of the earth are comfortably housed, fed and clothed. The world is not finished. There are whole continents to be developed. There is plenty for all to do. Let everyone work who will. It requires a certain number of workers to produce the daily necessities of the people. Every additional producer put to work adds to wealth. When the price of iron is under control, the manufacturing nations will make such regular and uninterrupted progress as will astonish the world. Iron is the most valuable gift nature ever bestowed upon a nation. The owners of the great iron properties have an opportunity of untold wealth within their grasp. They may, by wise action, change a business which in the past has been attended by one or two years of profit, followed by seven or eight years of loss, to a business of uninterrupted profit. The act which puts an end to seasons of industrial depression will inaugurate an era of unexampled prosperity to the iron-producing nations of the world."

TRANSPACIFIC TRADE.

A BRITISH VIEW OF THE CHANGES OF THE UNITED STATES IN THE COMMERCIAL STRUGGLE OF THE FAR EAST.

(From Syren and Shipping, London.)

It is a standing grievance with United States politicians of almost every shade of opinion that so little of the transatlantic trade should be done in American bottoms. They look back regretfully to the time when the position was the reverse of what it is at present and wonder if anything can possibly be done to reinstate the stars and stripes on the high seas. This regret is, no doubt, an understandable one, for during 1899, while no fewer than 5,390 steamships cleared from United States ports for Europe, only thirty-nine of this number flew the American flag. The determination to modify this condition of things has existed for years, but somehow or other the various remedial schemes adopted, or rather suggested, do not seem to fructify, and hence there is a growing tendency in the United States to regard as inevitable the fact that the North Atlantic is monopolized by Europe, and to seek a more hopeful field of conquest in the Pacific. The United States commissioner of navigation appears to favor this view, and from his official position and practical acquaintance with the problem, he should be thoroughly competent to form and express an opinion. He candidly admits, however, that American energy does not seem to run in the direction of shipping enterprises, and deplores the fact that other nations are already cultivating the trade with China and Japan. He admits the paucity of American tonnage on the Pacific, in spite of the fact that there are not sufficient vessels offering to convey the merchandise which comes forward to the American shores of the Pacific for transportation to China and Japan, and asks: "Is this lack of tonnage on the Pacific to be supplied by American vessels, or do we purpose, at the outset, voluntarily to abandon the carrying trade of the Pacific to our foreign rivals, who have already acquired control of the transatlantic trade?" The query is a rational one; for it is quite reasonable that, after the battle of Manila bay and the acquirements—in name, at least—of the Philippines, the United States, having an interest in the Far East, should try to extend its commercial relations with Asia's millions. But, here again, the struggle will be an up-hill one, for it will be much more difficult to oust the nations which at present enjoy so large a share of the trade with China and Japan from their position, than it was to defeat the Spaniards on the sea. During 1899, the number of steamships which cleared from United States ports for all parts of Asia was 189, of which total only twenty-four were American. If the number of sailing clearances were quoted, the disparity would, doubtless, be equally marked, for quite a big trade is conducted by sailers flying the British flag between the United States and China and Japan. The United States commissioner of navigation would alter this conditon of things, and though he does not exactly state how, he mentions some facts of great interest, and which should lead American capitalists to turn their attention to steamship enterprises as a possible field of employment for their money and energies. He points out, for example, that the European nations—notably ourselves and the Germans—are handicapped to a certain extent by having to utilize the Suez canal, which imposes a tax of 10 francs—say $2 of American currency—per net registered ton on the vessels using that artificial waterway. This, certainly, is a handicap, for the canal dues must be a charge on freight carried, and American vessels running from the Pacific ports to China and Japan would, of course, so far as this factor alone is concerned, be able to carry goods cheaper. But this is not the only point to be considered. British shipbuilders, and, we presume, German also, can build cheaper than can those of the United States, and in addition to this advantage, the Suez canal route to the Far East offers abundant facilities by which vessels can re-coal on the trip, and thus have all the more space for the conveyance of freight-paying cargo. United States vessels engaging in the Pacific trade will not only cost more, but will also have to carry coals for a 6,000-mile trip, unless they make a detour of from 750 to 1,000 miles for coaling purposes. Thus, the material advantages of the position are all in favor of Europe, which may be relied upon to act up to the part of the strong man keeping his house. At the same time, it is a factor in the case that United States trade with China and Japan amounts to something like $75,000,000 per annum. Hence, if the United States capitalists should decide to go in for a transpacific steamship venture on up-to-date lines, they will have a certain nucleus of trade on which they can rely. It is equally a point of importance, that the shortest route to the east is via the west. From London to New York is, say, seven days, thence to San Francisco, four days three hours, and westward by a seventeen-knot boat to Shanghai would be a trip of sixteen days duration. This works out to, say, twenty-seven days or a little over, against thirty-two days to Shanghai, via the Suez canal. There is just a possibility that some day a Nicaraguan canal may be opened, and though the mercantile fleets of the world would, of course, be allowed to use it—by paying—the shorter route thus afforded would give the United States a pull, and place the industrial centers of their Atlantic shore in closer communication with China and Japan. The whole position is, therefore, full of interest, and interest will increase, rather than diminish, with the effluxion of time.

A location has been secured for a new life saving station on the South Manitou island. The site is on the south side of the harbor, north of the light-house.

BUCKET AND SUCTION DREDGE.

DESCRIPTION OF A MACHINE BUILT FOR THE RUSSIAN MINISTRY OF MARINE FOR USE AT PORT ARTHUR, CHINA.

Among the displays of dredging machinery at the Paris exposition that of Messrs. A. F. Smulders of Rotterdam, Holland, stands foremost. The firm has an exquisite model on exhibition of the bucket and suction dredge which it designed for the Russian ministry of marine for use at Port Arthur, China. This dredger has buckets on a single ladder and is arranged to discharge the spoil into lighters alongside. The dredger has an open well in the stern and can cut her own flotation. Further, the dredger is equipped with a centrifugal pump by which the suction dredgings can be discharged either into lighters or on to the bank, or by means of a floating pipe to a distance of 700 ft. and to a height of 7 ft. Dredging and suction dredging can be carried on to a depth of 40 ft. The following are the principal dimensions: length, 161 ft. 6 in.; width, 33 ft. 6 in.; depth, 12 ft. 6 in. The hull is entirely of steel and conforms to the requirements of the Bureau Veritas. The stern uprights, as shown on the design on the opposite page, are carried down to the floor of the hull, while the forward uprights are fixed to the deck, standing upon a beam specially supported at each side of the hull. The vessel is divided into thirteen water-tight compartments.

The machinery comprises two compound engines of 300 I.H.P. each. These engines serve to drive the centrifugal suction pump, to rotate the screws as well as the tumbler of the dredging apparatus. The latter is driven through a toothed wheel and cone clutches. The principal boilers are two in number, of the marine type, with a total heating surface of 2,583 square feet. They carry a pressure of 120 lbs. There is a third boiler of the vertical type for driving the electric light engine and for supplying the steam heating appliances. Near the boilers are the bunkers, which will contain 50 tons of coal. Upon the deck are a number of winches and cranes for working the anchors, for warping the ship and elevating the dredging ladder. The engine for operating the ladder is fixed on deck. The tumbler has four sides and is of cast steel; the ladder has its two sides connected by cross bracing. It is carried by two bearings in the framing, coaxial with the tumbler. The buckets, the bottom and backs of which are cast steel, have a capacity of 800 litres (28 cubic ft.) The plates of which the front portions are built are 13 millimeters (5 in.) thick, and are strengthened by band of hard steel 300 millimeters by 25 millimeters (11.8 in. by 1 in.) The intermediate links have a double T section of 220 millimeters by 120 millimeters (8.6 in. by 4.7 in.) The pivots are of special steel and have a diameter of 3.5 in.

Above deck on the vessel is the bridge with a chart house and steam and hand steering gear. There is electric light both below and on deck. On the latter there are two arc lamps of 1,000 candle power, taking 8 amperes, while incandescence lamps are used below. The cabins are heated by steam.

The speed of the chain buckets is such that ten buckets are raised per minute. This gives a theoretical output of 16,950 cubic feet per hour. If the speed of the chain be increased, there is a corresponding increment in the output. The suction pump will lift from 17,600 to 22,000 cubic feet of sand per hour, delivering into lighters alongside. This may be done at a depth of 40 ft. The pump is driven directly by one of the main engines. There are clutches on the shaft by which the pump, the screw propeller, and the tumbler can be put in and out of gear. The pump case is of sheet plate, and on the inside it has a wearing plate of 10 millimeters (.4 in.) The suction opening of the pump has a valve by which the water can be shut out for purposes of inspection. It always remains primed, and, therefore, it is not necessary to have an ejector to start it. The suction pipe outside the vessel is of a solid construction, and is coupled by means of a flexible pipe to a curved piece which, sliding in grooves on the hull of the vessel, can be raised and lowered at will. The suction pipe can thus be raised completely out of the water when the vessel is steaming, and consequently offers no resistance to its progress. In the presence of the Russian commission the following results were obtained on May 21, 22, 23 and 24 last in the River Meuse:

	Conditions of contract.	Results obtained.
Output of dredgings	14,120 cub. ft.	18,000 cub. ft.
Output of suction	18,000 cub. ft.	23,700 cub. ft.
Speed	7 knots	7.7 knots

A VERY FAST MERCHANT VESSEL.

The trial given to the new Ward line steamer Morro Castle recently was of a very exacting kind. Passing down the Delaware from the works of the Cramps at Philadelphia, her screws were standardized and then she was run at sea for twenty-four hours, and exceeded her contract requirement of 18 knots under the most discouraging conditions. The intense heat almost prostrated the men, who were doing all in their power to make the test a success. During the run she made 18.20 knots for four hours, 18.65 for one hour, 18.16 for twelve hours and a fraction over 18 knots for the entire twenty-four hours.

"It was the most exacting test ever given a ship," said Edwin S. Cramp, who was in charge during the run. "United States war vessels are only given a four-hours' test, and the twelve hours required of the Russian cruiser Variag is considered unnecessarily severe. The Morro Castle is certainly the fastest vessel afloat under the American flag, excepting the St. Louis and the St. Paul. Her engines worked beautifully, and are so perfectly balanced that there was very little vibration. The test was satisfactory in every respect, and the few minor defects discovered can be remedied in a few days."

Attention, Veterans! The Nickel Plate road will run a G. A. R. special to Chicago on Monday, Aug. 27, under the auspices of Army and Navy Post. Train leaves Euclid avenue station 9:16 a. m., Broadway, 9:30 a. m., and Pearl street 9:35 a. m. Round trip, $6.35. Tickets good returning until Aug. 31, or by deposit until Sept. 30. Write, wire, 'phone or call city ticket office, 189 Superior street, telephone Main 218, or Euclid avenue station, telephone Doan 817. 176, Aug. 23.

HISTORY OF ATLANTIC RECORD BREAKERS.

The recent record of the Deutschland has revealed the possibility of traveling from New York to Queenstown in four days. The Deutschland's figures—5 days, 11 hours and 45 minutes from Sandy Hook to Plymouth—would have been cut to 4 days, 23 hours and 6 minutes had she been on the Queenstown route, which is 300 miles shorter. This, for the first time, would have cut the voyage to below the 5-day limit. This is approximately about half the time consumed by the Atlantic cracks of fifty years ago, when the palm for supremacy was hotly contested by the first ships of the Cunard company and their rivals of the famous American Collins line. There had been previous contests of speed between the Great Western, the Sirius, the Great Britain, the British Queen and other English-built vessels, but record breaking began in earnest in 1850, when the Collins ships threw down the gauntlet to the hitherto invincible Cunarders. In the following year the Collins ship Arctic, known as the "Clipper of the Seas," astounded the world by paddling across the Atlantic at the then tremendous speed of about 12 knots, and for the first time cut down the Queenstown record a trifle below 10 days. In the following year she again distanced all competitors by making the voyage in 9 days 13 hours. The Cunard line then put afloat as competitors the Asia and Africa, but neither equaled in size or speed the famous Arctic, Baltic, Pacific and Atlantic of the Collins fleet. But disaster was in store for these fine vessels. The swift Arctic was run down by the French steamer Vesta, off Cape Race, Sept. 21, 1854, and the Pacific left Liverpool June 23, 1856, and was never heard of afterward. The Adriatic, the largest and swiftest ship in the world, was put afloat, but the line soon afterward failed and went out of existence.

In 1860 the Cunard line launched the Scotia, the last of the side-wheelers, a superb ship of 4,000 tons, which made a record of 8 days and 22 hours. This, for several years, remained untouched. To beat the Scotia and her older but hardly less swift sister, the Persia, the Inman line in 1864 put on the screw steamers City of Paris and City of New York, about a third the size of their mighty namesakes of today. Then the rivalry became more furious than ever. Records were made by both lines of 8 days 14 hours, 8 days 12 hours and 8 days 11 hours.

For the first time minutes appeared on the record in 1866 when the Scotia made the run in 8 days, 7 hours and 10 minutes, against 8 days, 16 hours and 40 minutes for the City of Paris. In the same year the Scotia again lowered the record to 8 days, 2 hours and 48 minutes. The next of the great flyers was the superb City of Brussels of the Inman line, which in 1869 cut the record below 8 days, making the run in 7 days, 22 hours and 3 minutes, which was not beaten until 1873, when it was lowered by about 2 hours by the Baltic of the new White Star line. The Baltic's laurels were wrested from her two years later by the Inman liner City of Berlin, then, with the exception of the Great Eastern, the biggest ship in the world. She cut the record down to 7 days, 15 hours and 48 minutes, which was beaten the following year by 4 hours by the Germanic.

In 1880 the Guion line took up the running with the Arizona, with a record of 7 days, 7 hours and 23 minutes, and two years later the Alaska, of the same company, was hailed as the first six-day ship, when she made the run in 6 days, 18 hours and 37 minutes. The Oregon of the same line, afterward sold to the Cunard company and lost off the Long Island coast by collision, was the next wearer of the blue ribbon, with a record of 6 days, 11 hours and 9 minutes made in 1884, but in the same year the America, of the National line, wrested the prize from her by a margin of 1 hour and 9 minutes. The America was soon afterward purchased as a commerce destroyer for the Italian navy. The Cunard line again forged to the front with the Umbria and Etruria, the latter lowering the record in 1888 to 6 days, 1 hour and 55 minutes.

The five-day ship appeared the next year in the City of Paris, first of the twin screws, with a record of 5 days, 19 hours and 18 minutes. This was beaten by small margins by the Majestic and the Teutonic, but in 1893 the Paris regained her supremacy with a record of 5 days, 14 hours and 24 minutes. Then came the colossal Campania and Lucania, both record-breakers, the latter's run of 5 days, 7 hours and 23 minutes having never been beaten. Over the Southampton route the record of a trifle over six days was held by the American-built St. Paul, until the Kaiser Wilhelm der Grosse beat her with a run of 5 days, 17 hours and 8 minutes. The same steamer has to her credit the fastest run for one day ever made, when, on May 2, 1898, she steamed 580 nautical miles at an average speed of 23.43 knots. But the end is not yet, for next year the North German Lloyd expects to cut many hours off the Deutschland's record with a new monster, to be called the Leviathan, with a guaranteed speed of not less than 24 knots.

MOTOR BOATS ON THE DEAD SEA.

John F. Winter, consul to Annaberg, contributes the following communication to the state department:

"The Dead Sea, which for thousands of years has been a forsaken solitude in the midst of a desert, on whose waves no rudder has been seen for centuries, is to have a line of motor boats in the future. Owing to the continued increase in traffic and the influx of tourists, a shorter route is to be found between Jerusalem and Kerak, the ancient capital of the Land of Moab. The first little steamer, built at one of the Hamburg docks, is about 100 ft. long, and began the voyage to Palestine on June 16. An order has already been given for the building of a second steamer. The one already built and on the way is named Prodromos (that is, forerunner). It will carry thirty-four persons, together with freight of all kinds. The promoters of this new enterprise are the inmates of a Greek cloister in Jerusalem. The management of the line is entirely in German hands. The trade of Kerak with the desert is today of considerable importance. It is the main town of any commercial standing east of the Jordan and the Dead Sea. Its population consists of about 1,800 Christians and 6,000 Moslems. The merchants of Hebron are among the chief frequenters of the markets of Kerak."

Col. Thys, who is called the Belgian Cecil Rhodes, and other capitalists of Brussels, Hamburg and Bremen intend to build near Antwerp a ship yard which will be the largest on the continent. It is believed that the North German Lloyd Steamship Co. is interested in the undertaking.

Fig. 1.

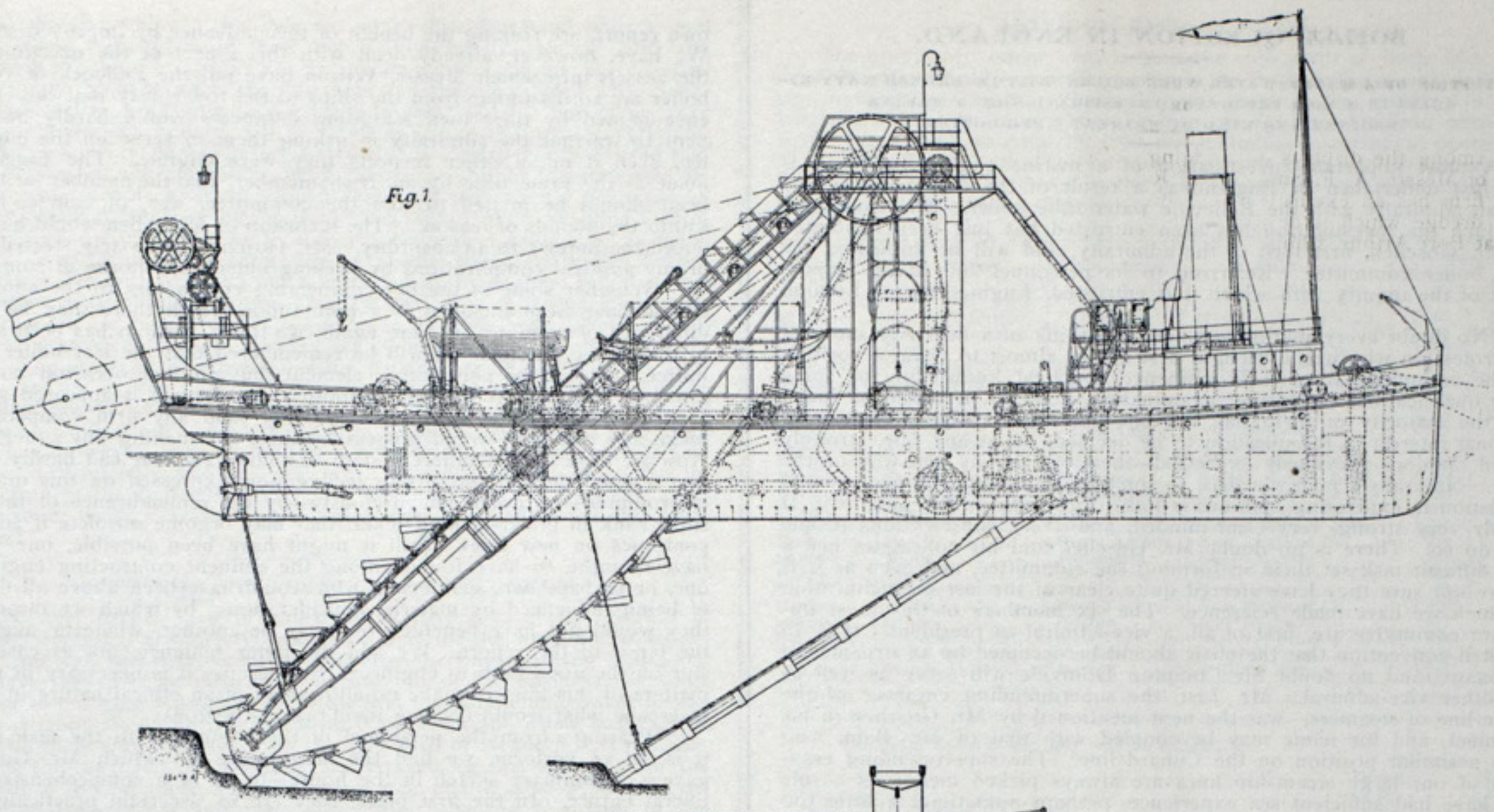


Fig. 2

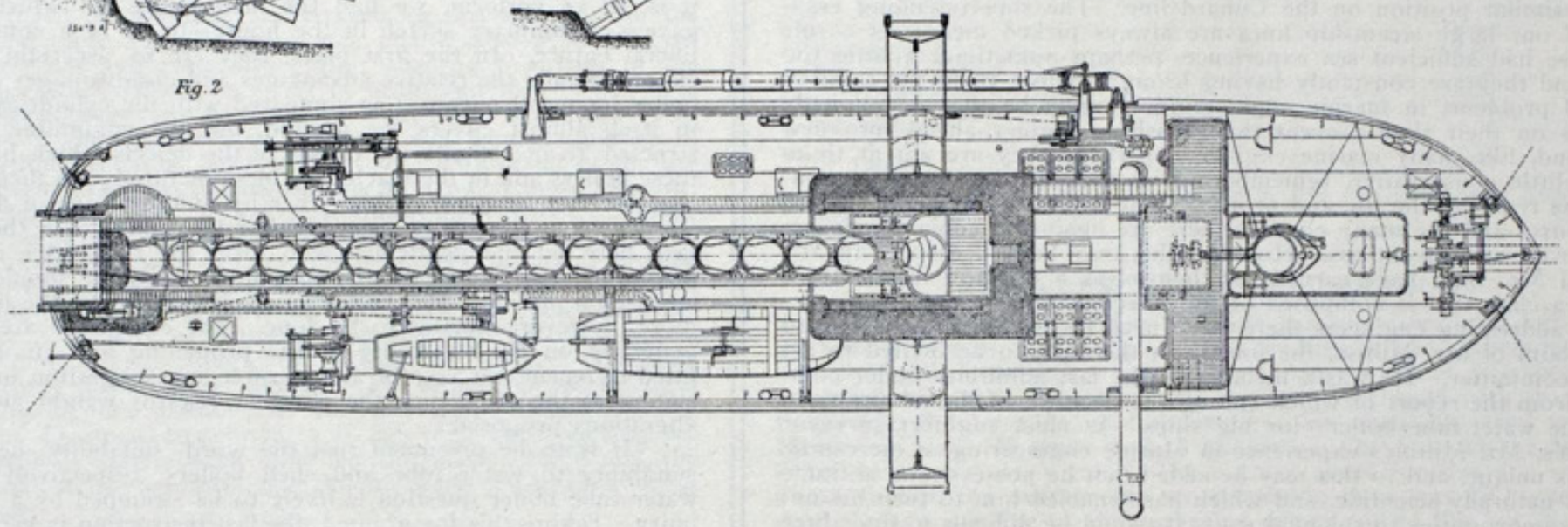


Fig. 3

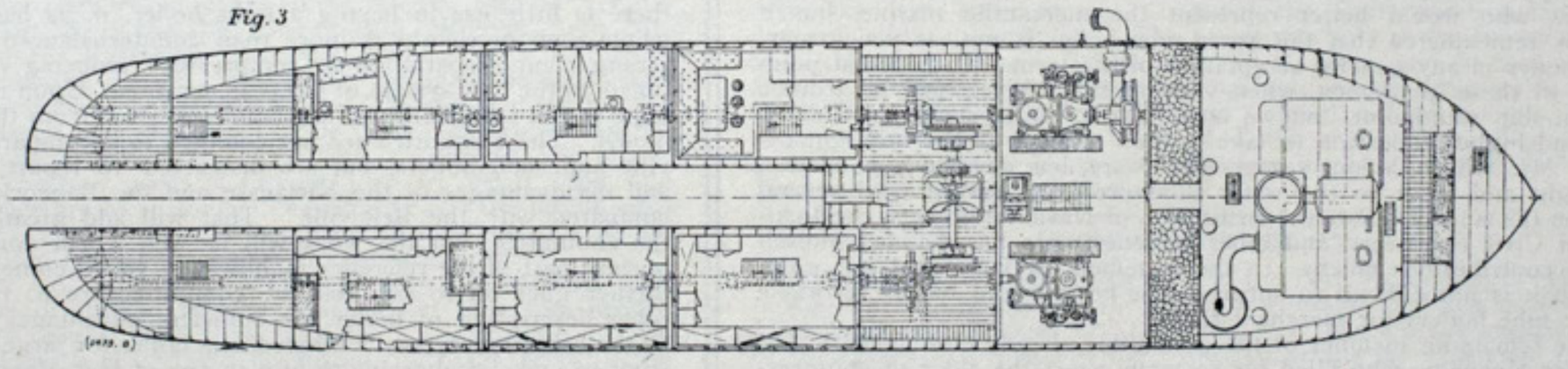


Fig. 4

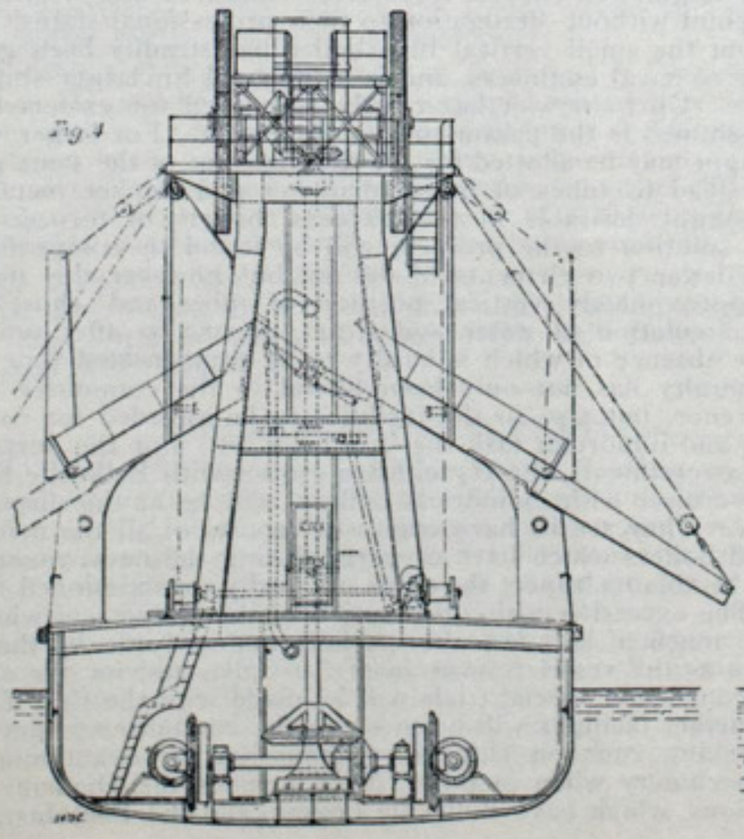


Fig. 5

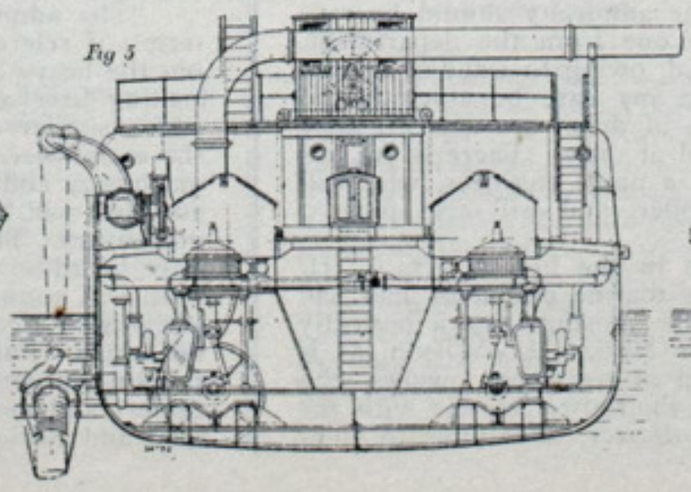
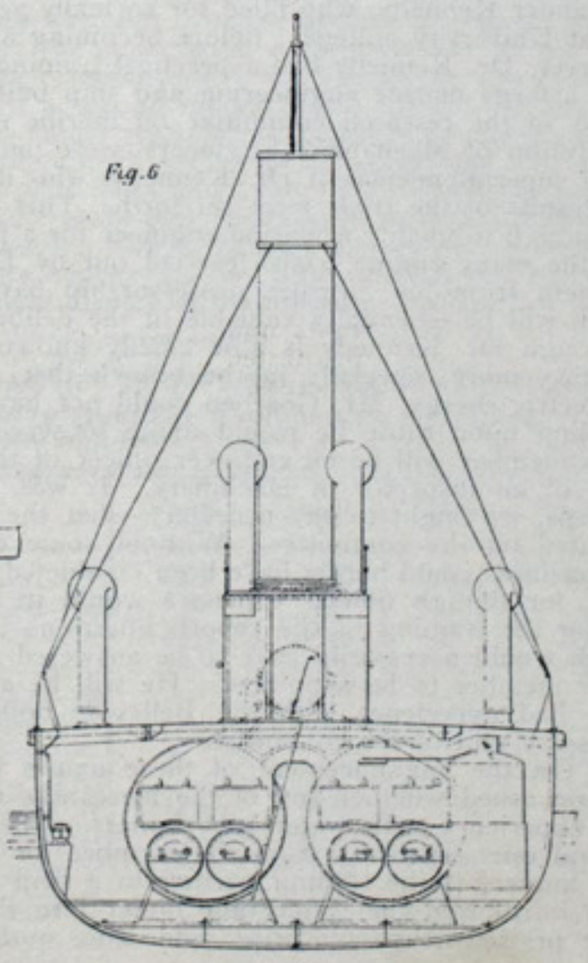


Fig. 6



BUCKET AND SUCTION DREDGER AT PORT ARTHUR, CHINA. CONSTRUCTED BY MESSRS. A. F. SMULDERS & CO., ROTTERDAM, HOLLAND.

From Engineering.

BOILER QUESTION IN ENGLAND.

ADOPTION OF BELLEVILLE WATER TUBE BOILER BY THE BRITISH NAVY RESULTS IN A MOST IMPORTANT INVESTIGATION OF A MARINE ENGINEERING KIND BY EMINENT AUTHORITIES.

A most important investigation of a marine engineering kind is that just undertaken in England as a result of the experience of the British admiralty with the Belleville water tube boiler. The committee to which the investigation has been entrusted has just been appointed by Mr. Goschen, first lord of the admiralty, and will be known as the navy boiler committee. Referring to its personnel and to the importance of the inquiry with which it is entrusted, Engineering of London says:

"No doubt every marine engineer can think of a dozen or more of his profession who would seem at first glance almost to claim a position on the committee from their eminence, practical knowledge, or some other qualification. On further examination, however, it would be found that the majority of these had the one great disqualifying element—a personal interest in the question to be decided, or, at any rate, strongly rooted opinions previously expressed—therefore, a bias one way or the other. Naturally a man who has, to some extent, staked his professional reputation in expressing opinions is loth to go back on his judgment. It is only very strong, very clear-minded, and very conscientious people who do so. There is no doubt Mr. Goschen and his colleagues had a very difficult task set them in forming the committee, and even as it is we are not sure they have steered quite clear of the last disqualification to which we have made reference. The six members of this most important committee are, first of all, a vice-admiral as president. It is an accepted convention that the chair should be occupied by an ornamental personage, and no doubt Sir Compton Domville will serve as well as any other vice-admiral. Mr. List, the superintending engineer of the Castle line of steamers, was the next mentioned by Mr. Goschen in his statement, and his name may be coupled with that of Mr. Bain, who holds a similar position on the Cunard line. The superintending engineers of our large steamship lines are always picked men. As a rule they have had sufficient sea experience, perhaps sometimes a little too much, and they are constantly having brought before them for solution practical problems in marine engineering. It may be that occasionally the calls on their time prevent them pushing inquiry ahead into new fields; and, like many marine engineers, perhaps they are apt at times to be a little conservative, remembering, as they do, the heavy responsibility as regards the life and property that devolves on the machinery they control and the many chances there are against pecuniary gain accruing from new inventions. However this may be as a rule, both Mr. List and Mr. Bain have earned for themselves a position in the front rank in a class that is composed of the selected of their profession.

"In addressing engineers there is no need to say anything in regard to the claim of Mr. Milton, the fourth on the list, to be invited to act on this committee. He was a member of the last admiralty boiler committee, from the report of which sprang the decision of the admiralty to adopt the water tube boiler for big ships As chief engineer surveyor to Lloyd's, Mr. Milton's experience in Marine engineering of mercantile vessels is unique, and to this may be added that he possesses an aptitude which is naturally scientific, and which has enabled him to turn his unrivalled opportunities to splendid use. It would be difficult to find three engineers who would better represent the mercantile marine, but it must be remembered that the water tube boiler is not, as yet, a mercantile boiler in any general acceptation of the term. The natural point of view of these gentlemen, when viewing the subject, will be from a merchant-ship standpoint; but we may trust to engineers of such experience and higher education to take up new ground as the occasion demands. Mr. Milton, as our readers are aware, has devoted a good deal of thought and labor to the water tube problem, having read several papers on the subject before the Institution of Naval Architects, the Institution of Civil Engineers, and other societies. He has devoted himself in these contributions chiefly to the statement of facts, and not opinions; but it is not difficult to surmise that he is by no means favorable to water tube boilers for merchant ships.

"The remaining member of the committee already announced is Dr. Alexander Kennedy, who filled for so many years the chair of engineering at University college. Before becoming a professor of engineering. however, Dr. Kennedy had a practical training during a term of service with a large marine engineering and ship building firm. The extended labors of the research committee on marine engine trials made by the Institution of Mechanical Engineers, were under the direction and personal superintendence of Dr. Kennedy, who made the reports in which the results of the trials were set forth. This experience in itself would be enough to qualify a marine engineer for a position on the committee, but the many engine trials carried out by Dr. Kennedy since his retirement from his former professorship have supplied an experience which will be essentially valuable in the deliberations of the committee. Although Dr. Kennedy is now chiefly known in connection with land practice, more especially in the branch that deals with the generation of electric energy, Mr. Goschen could not have made a wiser choice in deciding upon those he would invite to serve on the committee. The sixth member will be an engineer officer of the royal navy holding the rank of an inspector of machinery. It was, of course, inevitable—or, perhaps, we ought to say necessary—that the admiralty should be represented on the committee. Without some one from the department, the business could hardly have been conducted, owing to want of knowledge, for though official witnesses would in any case be at command during the framing of the report, questions of detail are sure to arise which would necessarily have to be answered at once. There is yet another member to be appointed. He will be a naval engineer, who will have had experience with the Belleville boiler, and will also form a necessary unit of the committee.

"On the announcement of these names in the house, Mr. C. H. Wilson asked whether any of the mercantile marine engineers had had any experience with water tube boilers. The question was a perfectly natural one, especially from the member for Hull. Mr. Wilson, as is well known, is the leading partner in a firm of steamship owners who have introduced the water tube boiler into their own vessels with the most praiseworthy enterprise; and who, moreover, according to their own report, are reaping the benefit of their advance by improved service. We have, however, already dealt with this aspect of the question, and the vessels into which Messrs. Wilson have put the Babcock & Wilcox boiler are so dissimilar from the ships of the royal navy that the experience gained by their own sea-going engineers would hardly be sufficient to warrant the admiralty in asking them to serve on the committee, even if in all other respects they were eligible. The suggestion made at the same time by an Irish member, that the member for Gateshead should be invited to join the committee, was, of course, hardly within the bounds of reason. The inclusion of Mr. Allen would have reduced the inquiry to an absurdity. Mr. Goschen has wisely steered clear of any political complications by keeping outside the house of commons.

"Whether some of the big engineering contractors to the admiralty should have been included is a point upon which there may be some difference of opinion; but here again, we think, wisdom has been shown in the course pursued. It will be remembered that the last boiler committee included the contracting element, but on that occasion no rival interests clashed. When the committee was formed it appeared simply a case of shell boiler against shell boiler, and any firm competent to make any one type would possess facilities for making any other type. Now we have quite a different state of affairs, and one can hardly doubt that a good deal of the strong feeling now expressed on this question is prompted—no doubt unconsciously—by the remembrance of the vast sums sunk in boiler-making plant, that may become obsolete if advance continues on new lines. Still it might have been possible, one would have thought, to have found among the eminent contracting engineers, one, or perhaps two, gentlemen, who would have been above all danger of being influenced by material considerations; by which we mean that they would not have benefited one way or another, whatever might be the tenor of the report. We add the latter sentence, not as casting a slur on the good faith of engineers, but because it is necessary in public matters of this kind to make no allowances of an ethical nature in order to escape what would become invidious distinctions.

"Passing from the personnel of the committee to the task which it is set to perform, we find the instructions—of which Mr. Goschen gave a preliminary sketch in the house—to be of a comprehensive and liberal nature. In the first place, they are to 'ascertain practically and experimentally the relative advantages and disadvantages of the Belleville boiler for naval purposes as compared with the cylindrical boiler.' That in itself almost covers the ground, but the committee are further instructed 'to investigate the causes of the defects which have occurred in these boilers and in the machinery of ships fitted with them, and to report how far they are preventible either by modifications of detail or by difference of treatment, or how far they are inherent in the system.' The task here set the gentlemen who form the committee is one of great magnitude, and the report the committee will issue should be a complete treatise on marine boiler construction, if they follow the instruction fully; more, however, remains to be done. The committee are 'also to report generally on the suitability of the propelling and auxiliary machinery fitted in recent war vessels, and to offer any suggestion for improvement, stating at the same time the effect as regards weight and space of any alterations proposed.'

"It is to be presumed that the word 'suitability' here used, means suitability to water tube and shell boilers respectively, otherwise the water tube boiler question is likely to be swamped by a much wider inquiry. Taking this for granted, the last instruction is very necessary, for there is little use in having a light boiler, if, as has been alleged, the whole gain in weight is more than counterbalanced by additional feed arrangements, separators, air compressors, reducing valves and other adjuncts to the new system of steam generation. Upon these points we may hope to get something definite and authentic from the report when it is issued. The committee are not confined to a comparison between Belleville and shell boilers, but are instructed 'to report on the advantages and disadvantages of the Niclausse and the Babcock & Wilcox boilers compared with the Belleville.' That will add greatly to the labors of the committee; but the work will be well worth doing. The most important part of the reference is, however, yet to come, for the instruction further goes on to say that the committee are to report 'whether any other description of boiler has sufficient advantages over the Belleville or the other two types mentioned as a boiler for large cruisers and battleships to make it advisable to fit it in any of Her Majesty's ships for trial.' This last point opens up the very question of small or vertical tubes as against large or horizontal tubes. It is a question so big, so important, and so complicated that the mercantile marine engineers who are on the committee might well express themselves unable to deal with it from a naval standpoint without derogation to their professional status. There is no doubt but the small vertical tube boiler has steadily been gaining the confidence of naval engineers, and is being used for larger ships and higher powers. Up to now it has chiefly been used for extremely fast craft where lightness is the paramount consideration. For larger vessels additional weight may be allotted for the development of the same power, and this may lead to tubes of larger diameter and thicker metal than have been thought desirable in the 'express' boilers of torpedo craft. Probably the solution to the problem will be found in compromise in regard to the latter two elements of design, but however this may be, vertical or approximately vertical position of tubes and short direct passages for circulation of water and steam, appear to offer points of advantage, the absence of which is hardly to be compensated for.

"The admiralty has not only been liberal to the committee in the terms of reference, but also in the facilities to be afforded for carrying out the heavy and important task that has been set. For the purpose of making direct experiments, the Hyacinth, a cruiser with Belleville boilers, and a similar cruiser with cylindrical boilers, will be at the disposal of the committee. They are to have copies of reports of all the defects of machinery and boilers which have occurred during the naval maneuvers, and they will be able to inspect the ships especially commissioned for the maneuvers. The excessive coal consumption of the Europa, of which we have heard so much of late, is to be specially inquired into by the committee as soon as the vessel returns from Australia, and for the sake of arriving at a conclusion special trials will be made with the ship if found necessary. Further facilities will be given to the committee to get information by making runs on ships in commission, or examining their boilers and machinery when in port. This includes the Diadem, Arrogant and Furious, which have Belleville boilers, and the Pactolus, which

has Blechynden boilers; the Pelorus, which has Normand boilers, and has recently returned from three years' continuous service, and the Powerful will also be available for examination during their refits. Further, the Sharpshooter, the first vessel in the navy fitted with Belleville boilers; the Seagull, with Niclausse boilers; and the Sheldrake, with Babcock & Wilcox boilers, will be available for comparative experiment.

"In conclusion, Mr. Goschen stated that it is particularly desired that any conclusions the committee might arrive at should be supported by experimental proof as far as possible, and that they should propose any further experiments they might think necessary. With so able a committee, and so comprehensive a reference, the report cannot fail to make a valuable addition to the knowledge of marine engineers in this branch of their profession. With so much work before them there is a fear that the report may almost become obsolete before it is issued, supposing the precedent of many former inquiries to be followed. There is also another drawback to these committees of inquiry on engineering subjects. The professional officers finding matters largely taken out of their hands, are apt to lean over much on the reports and take their decisions as a final answer to further advance. This is but natural in the case of people so everlastingly heckled as the admiralty engineers; of late years there has, however, been so healthy a manifestation of high professional feeling at Whitehall, that we may hope the spirit which led to the introduction of the Belleville boiler into the navy will so continue as to bring about its supercession by a boiler even more advanced and more efficient."

WITH THE ATLANTIC COAST BUILDERS.

Six steel barges now in course of construction at the Harlan & Hollingsworth Co.'s works, Wilmington, Del., for the Rockland & Rockport Lime Co. will completely revolutionize the lime carrying trade, and will have the effect of ultimately driving out of the business the large number of coasting schooners that now find lucrative employment in this business from Maine ports to Boston, New York and other large cities. Recently there was launched from the ship yard of Neafie & Levy, Philadelphia, the tug Fred. E. Richards, constructed for this company for the purpose of towing these barges. She is one of the most powerful tugs on the Atlantic coast and resembles closely the tug Waltham of the Staples Coal Co. She is 135 ft. long, 32 ft. beam and 15½ ft. depth of hold. The six steel barges are each 200 ft. long, 38 ft. beam and 17 ft. deep. They are of the compartment type and will have a capacity of 16,000 barrels of lime, equal to 1800 tons of coal. As a result of the use of compartments in these barges cargoes can be handled more expeditiously, as it enables a consignee to have his consignment in one compartment. It is probable that the barges will take coal as return cargo to eastern ports and in this way can be run with very profitable results. Some idea as to the complete changes to be wrought in this branch of the coasting trade may be gathered from the fact that the schooners engaged in it have a capacity of between 1600 and 1800 barrels of lime, while under the new order of things each of these steel barges is capable of carrying ten times this amount. Sept. 1 is the time proposed to begin operations. Shipping men predict that the entrance of barges into the lime trade will be disastrous to schooners as was their entrance into the coal trade. Recently barges were built for the plaster trade and the undertaking proved most successful, and this no doubt led to their being built to carry lime.

A four-masted wooden schooner, the Maud Palmer, was successfully launched on Thursday last at the ship yard of Wm. Rogers, Bath, Me. The Palmer was built for Massachusetts parties, of whom Wm. F. Palmer of Dorchester is managing owner. Mr. Palmer designed the vessel, and has had general oversight of her construction. The vessel measures 214 ft. on keel, 42.9 ft. beam and 23 ft. deep. She is of 1745 gross tons and has a carrying capacity of 1529 tons. Her frame is white oak and planking of hard pine. The four masts of Oregon pine are 108 ft. long, and the topmasts of spruce are 54 ft. long. The rigging is wire, set up with turn buckles. The Palmer is to be commanded by Capt. David H. Sumner of Thomaston, late of the schooner Sadie Sumner.

Cobb, Butler & Co., Rockland, Me., have closed a contract with Crowell & Thurlow of Boston for the construction of a four-masted wooden schooner of about 2300 tons capacity. Dimensions of the schooner will be: Length of keel, 205 ft.; breadth of beam, 43 ft.; depth of hold, 22½ ft. The keel will be laid immediately after the launching of the Emery schooner, which will occur Aug. 25. The frame of the new schooner will be of hard wood and hackmatack. The craft will be built to class A1 for fifteen years and will be fitted with steam gear and all the modern appliances. This will be the fourth vessel laid in the yard of Cobb, Butler & Co. during the present year.

The ship building establishment of Townsend & Downey on Shooters Island in Newark bay is now fully equipped with modern appliances for the construction and repair of vessels of all kinds and has a large amount of work on hand. Their marine railway, just completed, is one of the largest in the world and will accommodate a vessel 400 ft. long and weighing 4,000 tons. It was built at a cost of $125,000. The four-masted English ship Vimeira is now in the yard being repaired.

The Newport News Ship Building & Dry Dock Co. has been awarded the contract for the rebuilding and repairing of the North German Lloyd liners Bremen and Saale, which were badly damaged in the great New York harbor fire.

CONTRACTS FOR ELEVATORS.

The Morse Williams Co. of Philadelphia, leading manufacturers of elevators, report two very important contracts for the month of August. One is for the Union passenger station at Pittsburg and involves five hydraulic passenger elevators, two hydraulic passenger and freight elevators and six hydraulic freight elevators of the plunger type, all including the latest improvements and of the best designs. The second contract involves two hydraulic passenger and two hydraulic freight elevators for the terminal station, Chesapeake & Ohio Railroad.

The Morse Williams Co. are among the most progressive manufacturers of the country and are well equipped for furnishing elevators suited to every purpose. They are thoroughly informed as to every improvement in their special line of manufacture, and give perfect satisfaction to their many patrons.

SHIP BUILDING AT BATH.

The output of wooden vessels from the ship yards of Bath, Me., during 1900 will probably exceed any year in the history of that ship building city, notwithstanding the setback that was given to this industry in New England when iron came generally into use for ship building purposes. From Jan. 1, 1900, to Aug. 18, 1900, not including government operations at the Bath Iron Works, the number of vessels built and documented in the district of Bath is shown by the following official table obtained from the custom house of the district.

Rig.	Name.	Hail from.	Built by.	Tons. Gross.	Net.
Schooner..	Mary W. Bowen..	Fall River.....	New England Co.....	2,153	1,907
Schooner..	Marie Palmer.....	Boston.....	William Rogers.....	1,904	1,594
Barge.....	Iowa.....	New York.....	New England Co.....	1,606	1,473
Schooner..	Henry Weiler.....	Bath.....	Frank S. Bowker.....	400	334
Barge.....	Elx Garden.....	Bath.....	Kelley, Speare & Co..	847	749
Steamer...	Cohannet.....	Taunton.....	Kelley, Speare & Co..	69	34
Schooner..	Helen W. Martin.	Bath.....	Percy & Small.....	2,265	2,020
Barge.....	Benavides.....	Perth Amboy.	New England Co.....	924	819
Steamer...	Transfer No. 14...	Bath.....	Bath Iron Works.....	322	189
Barge.....	Norton.....	Taunton.....	Kelley, Speare & Co..	489	412
Barge.....	Sharon.....	Taunton.....	Kelley, Speare & Co..	482	406
Barge.....	Hampshire.....	Philadelphia..	Kelley, Speare & Co..	830	735
Barge.....	Georgie.....	New York.....	New England Co.....	1,609	1,488
Schooner..	Calumet.....	Boston.....	Kelley, Speare & Co..	1,241	1,094
Barge.....	Bee.....	Perth Amboy.	New England Co.....	919	802
Steamer...	Globe.....	Richmond.....	Noble Maxwell.....	137	62
Barge.....	Flora.....	Boston.....	Kelley, Speare & Co..	865	769
Sloop.....	George Leslie.....	Bath.....	N. F. Hanson.....	29	21
Barge.....	Indiana.....	New York.....	New England Co.....	1,626	1,506
Barge.....	Grace.....	Boston.....	New England Co.....	877	781
Schooner..	Helena.....	New York.....	Kelley, Speare & Co..	619	504
Schooner..	W. C. Carnegie...	Portland.....	Percy & Small.....	2,663	2,380
Schooner..	Maude Palmer....	Boston.....	William Rogers.....	1,745	1,529
Total tonnage				25,866	22,598

The total tonnage for 1899 was as follows:

	Tonnage. Gross.	Net.
Two ships	6,415	5,835
Two schooners	3,921	3,448
Three steamers	1,697	936
Twenty-seven barges	27,070	24,106
Two sloops	17	13
Totals	39,120	34,338

It is estimated that the total tonnage in 1900 will be at least 5,000 tons more than 1899.

NEW FRENCH LINER LA LORRAINE.

The new French liner La Lorraine has just completed her maiden trip from Havre to New York. She is the biggest and swiftest merchantman flying the tri-color. On her trial trip she made 22 knots over a measured mile, thus indicating that she may be classed with the swiftest Cunarders, the Lucania and Campania. She made the trial trip from Havre in 7 days, 15 hours and 15 minutes. On Aug. 13 she made 487 knots, her fastest day's run. The average speed for this day was 20.07 knots, though the average for the remaining days was 17 knots. The slow passage was due to an overheated piston and to the fact that a raw crew was in the stoke room. Owing to the latter condition the officers determined not to drive her. The vessel was built in the company's yard at St. Nazaire. She is 580 ft. long, 60 ft. beam, and 30 ft. 6 in. deep. Her displacement is 15,300 tons and her engines are designed to develop 22,000 H.P. She has twin screws and is fitted with bilge keels. She is equipped with a complete outfit of Blake pumps, including twin air pumps. La Lorraine has accommodations for 446 first-class, 116 second-class and 402 third-class passengers.

ROEBLING EXHIBIT.

Among the conspicuous exhibits at the Paris exposition in the gallery of the American section of the mines and mining building is that of the John A. Roebling's Sons Co., Trenton, N. J. The most prominent feature of the exhibit is a model of the Brooklyn bridge for which the company furnished the wire and which was built from the designs of John A. Roebling and was erected under the supervision of himself and of his son, Washington Roebling. The original model was lost in the Pauillac, but the company had forwarded a second model before the fate of the ship was definitely known. The model reproduces in detail to scale the characteristics of the famous bridge from anchorage to anchorage. Two fine mahogany cases with large plate glass doors form the foundations for the anchor towers. The bridge towers rest upon eight superposed coils of wire rope, tapering from 1¼-in. wire to ¼ in. The bridge is made of silver plated strips and wire ropes. In the space underneath the main span of the bridge is a general display of the company's products.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of August 22, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	35¼	35½	35¼	35½
American Steel & Wire, Pfd.....	.....	.....	.....	.....
Federal Steel	34⅜	34⅜	34	34⅜
Federal Steel, Pfd.....	67	.....	.....	67
National Steel	.....	.....	.....	.....
National Steel, Pfd.....	.....	.....	.....	.....
American Tin Plate	26	.....	.....	26
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	19¾	19⅞	19¾	19⅞
American Steel Hoop, Pfd.....	.....	.....	.....	.....
Republic Iron & Steel	11⅜	11½	11¼	11¼
Republic Iron & Steel, Pfd	.....	.....	.....	.....

GAINS IN THE STEAM TURBINE.

An apparently important, and to the writer, at least, new, fact in the operation of the steam turbine is revealed by experimental investigations in progress for some time past in the laboratories of Sibley college, with both saturated and superheated steam. Contrary to the usual theory of that apparatus, it is found that a very substantial gain may be had by the use of superheat, not only in efficiency, but also in capacity.

The new steam turbine is not subject to that form of waste known as "initial" or "cylinder" condensation which adheres to every piston-engine as a consequence of the large fluctuations of temperature which accompany the variations within the cylinder between boiler and condenser pressures, and which, with the best of engines employing saturated steam, amount to 10 or 20 per cent. and to a multiple of such figures for small machines. The interior surfaces of the turbine, in steady working, remain at precisely the same temperatures and absolutely without those fluctuations which produce waste in the reciprocating and in the other forms of rotary engine. As it is to reduce this particular waste that superheating is employed, ordinarily, there would not be expected to be found any other gain by its use in the steam turbine than that increase of thermodynamic efficiency which is due to the widened range of temperature, in this case amounting to about one-tenth of one per cent. per degree of superheat. Investigations by Messrs. Schieren and Thomas, above alluded to, show, on the contrary, a gain of about one per cent. for each one and two-thirds degrees centigrade, three Fahrenheit degrees, of superheat and the remarkable and unexpected result of an increase in the capacity of the machine of about 100 per cent. by the use of but twenty degrees centigrade, thirty-seven degrees Fahrenheit, superheat. The "water-rate" of the turbine, a La Val machine of 10 H. P. as rated, decreased from about 21.7 kilogrammes, 48 lbs., with pressure rising from 21.7 kilogrammes, 44 lbs., to 1.99 kilogrammes, 44 lbs., with pressure rising from three atmospheres to eight, with a two-thirds vacuum, and with saturated steam; while the figures fell off about 12 per cent. with superheating, rising to a very moderate maximum as above. Deduced to thermal units per horsepower per hour, the same effect appears in a very similar proportion. The causes of the gain in thermodynamic efficiency and of capacity are presumably identical—the extinction of the friction wastes due to the retardation of the current of fluid traversing the passages of the turbine by concurrent resistances coming of the weighting of the current of steam with drops and mist and the adherence of moisture in mist, drops and even streams, very probably, to the walls of the steam passages of the turbine. The phenomenon will, however, be the subject of extended investigation in the course of the work in research constantly in progress and a way will be found of precisely identifying the cause and determining the laws governing its action in the production of these variations of efficiency and capacity. That this apparently obvious explanation is the correct one and, certainly, that the gain is not due to any such action as produces the remarkable beneficial effects observed in the reciprocating engine, is tolerably well indicated by the fact that the gain, in this case, by superheating, is substantially proportional, so far as here carried, to the amount of superheat and the graphic log shows a straight line of decreasing consumption of steam.—Prof. R. H. Thurston, in Science.

TWENTY YEARS' PROGRESS IN MACHINERY.

Dealing with the subject "Twenty Years' Progress in Cargo Boat Machinery," Mr. J. F. Walliker, member of the British Institute of Marine Engineers, said in a paper read recently before that society that in his opinion the most advanced type of multiple-expansion engine was that with five cranks designed and introduced by the late Mr. Mudd. Engines of this type were said to be propelling a vessel of 5,800 tons at an average speed of 9 knots on 13½ tons of coal, or at the rate of 1 lb. per I. H. P. per hour. In 1872 the average coal consumption was 2.11 lb. per I. H. P., and in 1881, 1.828 lb., while to-day the ordinary cargo boats average 1.5 lb. per I. H. P. for all purposes. The author considers the principal drawbacks of the engines of the present day are the screw shaft and the steam pipes. With regard to the former, two things have always appeared inexplicable, first that the shaft should be the only piece of machinery in the ship supposed to be capable of running with water alone, and the other that when one form of shaft has failed an alteration in form and design is not adopted, but the old error is repeated. As regards steam pipes he is disappointed at the slow progress made in the use of the expansion gland. Being practically a universal joint and not liable to give trouble in any way whatever, it seems to suggest that it will come into general use, after the trouble experienced by pipes breaking at the flange through stress has been thoroughly appreciated. He believes the day will come when the custom of depending on beds alone for the necessary elasticity and expansion will be a thing of the past. Owing to the enhanced importance of the machinery since the practical abolition of masts, he predicts that there will be a time when the master will act as chief engineer, and as a step in this direction he suggests that engineers should be encouraged to pass an examination and receive a certificate for proficiency in navigation, in the same way that deck officers are at the present time enabled to pass one in steam. In conclusion the author summarized the progress of the last twenty years as consisting of: Iron replaced by steel in boiler manufacture; three, four, and five-crank engines adopted; working pressure increased; coal consumption reduced; average size increased; and corrosion in boilers practically prevented.

STEAMBOAT ON LAKE TITICACA.

An interesting engineering feat which has recently been accomplished is the placing of a steamboat of 550 tons on Lake Titicaca, between Bolivia and Peru, a sheet of water 120 miles long, 325 miles from a seaport, and nearly 13,000 ft. above the sea level. This vessel was built at Leven ship yard, Dumbarton, Scotland, temporarily put together, and then transported in sections to Mollendo, whence it was carried in twenty-two cars up the railroad which skirts the steep sides of the Andes to the lake side. There it was once more put together and the boilers and engines installed. The Coya (such is the vessel's name) is 170 ft. long, 26 ft. beam and has accommodations for forty-five first-class and forty second-class passengers. The distance traversed by this steamer is 100 miles, the journey occupying ten hours. The vessel serves as a means of communication between the republics of Bolivia and Peru.

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MODERN TRAINING IN SEAMANSHIP.

J. R. Thursfield, in a paper read before the United Service Institution (British), holds that the advent of the torpedo boat and destroyer for the training of navy officers, just as sails were becoming extinct, is almost providential. This is in line with the opinion heretofore expressed as to the value of these small craft as a means of giving young officers the training for independent command which they cannot get on a huge battleship. The inevitable tendency of such constructions is to destroy the individuality to which the greatest successes in naval war are due. Mr. Thursfield's subject was the training of seamen and he drew his conclusions from the accepted principles that a seaman is one who has assimilated the sea as an organic part of his experience, and is as familiar with it as any other craftsman with the materials of his craft, and that a gun's crew or a ship's company, or any organized aggregate between the two, is an organism articulate, coherent and instinct with the sense of common action and comradeship. These two elements of a fighting seaman's efficiency were his subject, and he described the sea as the condition common to both. The advent of sails transferred the center of naval gravity from the Mediterranean to the Atlantic, and Mr. Thursfield insisted that the advent of steam is not unlikely to transfer it to the far larger and more distant areas of the Pacific ocean. In considering the question of a substitute for the vanishing discipline of masts and sails an analogy was drawn between the discipline of the sailing ship and that which is given by Greek and Latin—"the Humanities"—in a liberal education. The purpose in retaining these is to brace the mind, quicken the intelligence, enlarge the sympathies, and stimulate generally the faculties of the mind; and when Greek and Latin were dead languages the teachers retained them for their purposes, with beneficial results which none can gainsay. In the opinion of Mr. Thursfield the essential qualities of self-reliance, resource, quickness of eye and steadiness of nerve, self-possession and steadfastness in danger and helpfulness in difficulties, cannot be gained without this discipline of masts and sails. A very distinguished officer, who was no advocate of retaining masts and sails, said to him: "I felt myself to be 50 per cent. more worth as a naval officer after two years experience of that training."

In a very lively discussion which followed the reading of the paper. Sir Culme-Seymour said that in his own experience the seaman of to-day was better than his predecessors, whereas if the arguments of the school of masts and sails were valid, he should be worse. The crew of the Ramillies, the smallest men physically he had ever commanded, were, in discipline and sea-going qualities, as good as any he had met; and he asked his hearers to carry back their minds to the Crimea, and say whether the naval brigade at Ladysmith was not in every way as good as the brigade in the old days. He looked upon the discussion as the last dying gasp of masts and sails. Taking the same line, Sir N. Bowden-Smith contended that the men must be trained in the ships in which they are to fight, while Sir John Hopkins expressed the opinion that as good men could be got without masts and sails as with them. All of these officers agreed, however, that more training at sea was required. A large number of officers of junior grades, commanders and lieutenants, took part in the discussion and all of them advocated the old system of training. All of the speakers agreed that this gave just the qualities required in seamen and that the present system of training British seamen is a failure. The doubt was as to whether the resuscitation of a training ship squadron of four-masted vessels would remedy the evil.

The Harlan & Hollingsworth Co., Wilmington, Del., is so crowded with work that it has been found necessary to parcel out some of it to other parties.

The Nickel Plate road offers the low rate of one cent a mile travelled to Chicago for the annual encampment of the G. A. R. Tickets on sale Aug. 25 to 29, inclusive, good returning until Aug. 31 inclusive, or by deposit until Sept. 30 inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 154, Aug. 29

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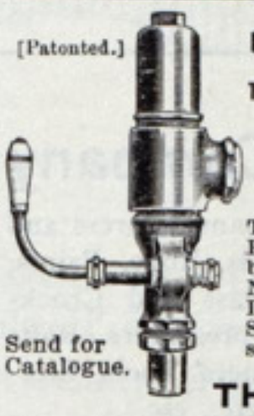

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Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X, steamer of the Tarn class.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE**.

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RUSSIAN NAVY.

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ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACCHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGU**, battleships.

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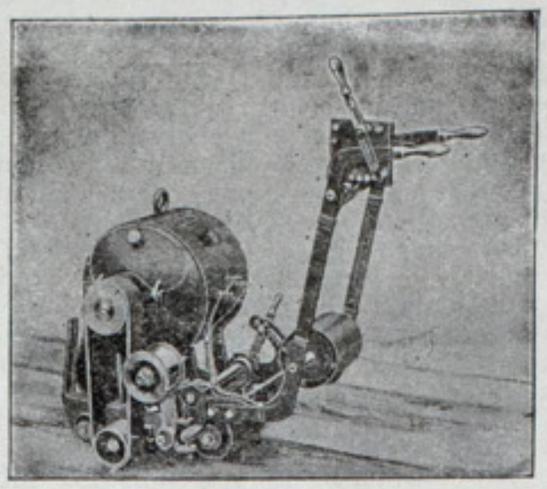

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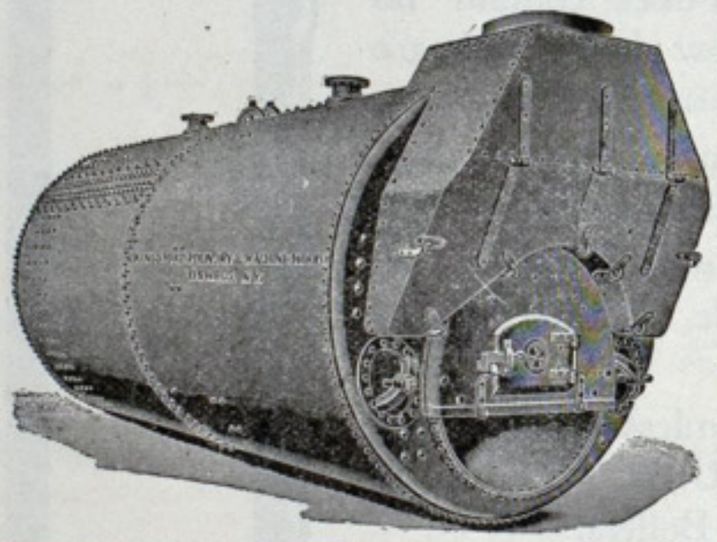

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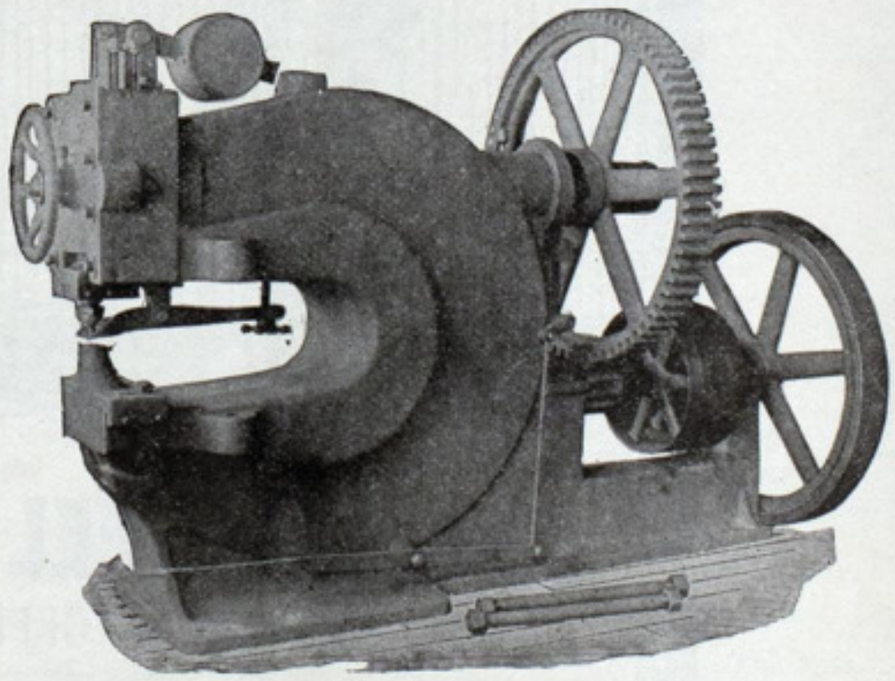

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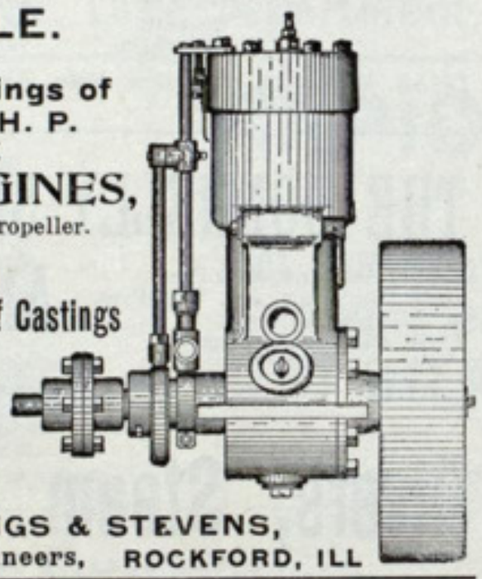

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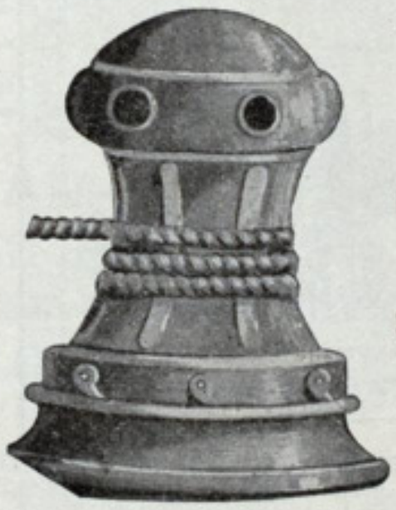

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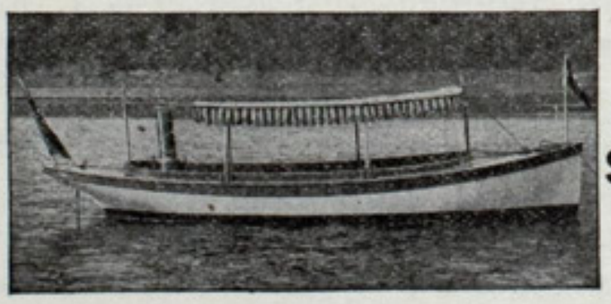

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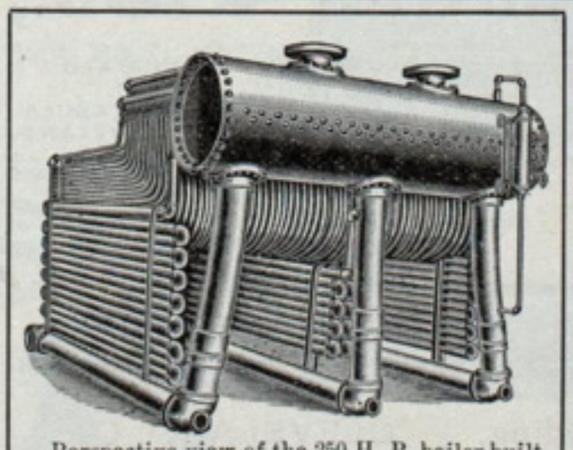

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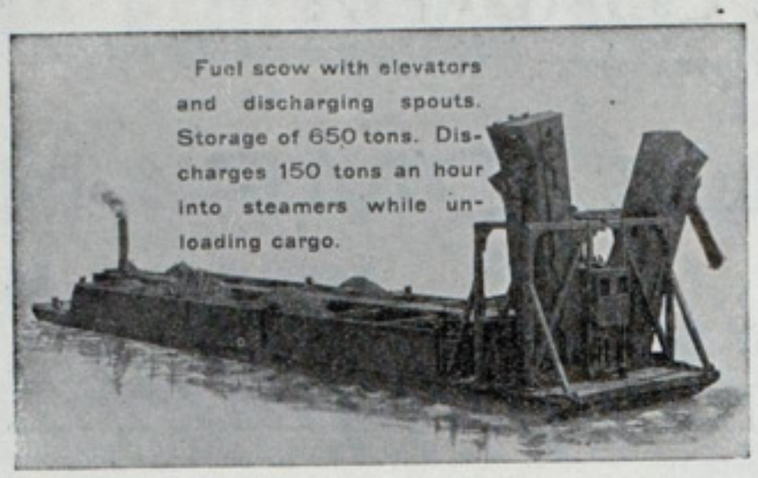
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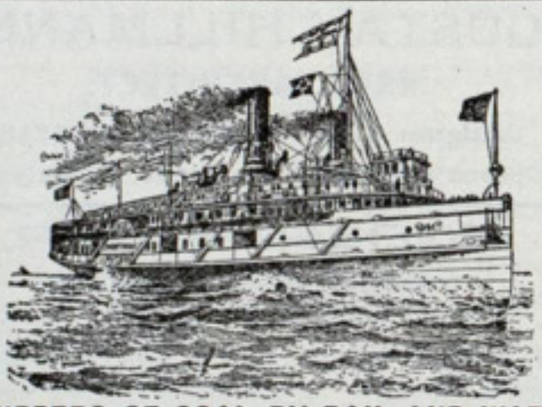

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Harlan & Hollingsworth Co.....Wilmington, Del.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Pelton Engineering Co.....Cleveland.
Sturtevant, B. F Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Simpson, W. L.....5th and Buttonwood, Philadelphia.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Warren Webster & Co.....Camden, N. J.
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FLUSHOMETERS.
Kenney, The Co.....New York.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Scott Co., W. L.....Erie, Pa.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.
Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co .Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co. .....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

American Bridge Co.....New York.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.

Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Almy Water Tube Boiler Co. 11
*American Bridge Co. 26
American Line 7
American Ship Building Co. 1
American Ship Windlass Co. 2
American Steam Gauge Co. 1
American Steel & Wire Co. 1
Armstrong Cork Co. 40
Ashton Valve Co. 12
Atlantic Works 5
Atlantic Tube Co. 7

Babcock & Wilcox Co. 11
Baldt Anchor Co. 9
Baker, Howard H. & Co. 9
Bath Iron Works, Ltd. 1
Bertram's Oil Polish Co. 1
Bessemer Steamship Co. 28
Bethlehem Steel Co. 6
Big Four Railway 39
Blake, Geo. F., Mnfg. Co. 9
*Bliss, John & Co. 30
*Bloomsburg & Co., H. 31
Boland, J. J. 34
*Boston & Lockport Block Co. 40
*Boyer Water Tube Boiler Co. 31
Bourne-Fuller Co. 12
Brown & Co. 34
Brown Hoisting & Conveying Mach. Co. 2
Buffalo Dry Dock Co. 28
Buffalo Forge Co. 12
Bull & Co., A. H. 34

Calvin Co., The 1
Castner, Curran & Bullitt 33
Champion Rivet Co. 28
Chase Machine Co. 6
Chicago Pneumatic Tool Co. 3
Chicago Ship Building Co. 2
*Cleveland Punch & Shear Works Co. 30
C. C. C. & St. L. R. R. 39
Conners, W. J. 34
Continental Iron Works 2
Cory, Chas. & Son 10
*Craig Ship Building Co. 30
Cramp, Wm., & Sons, S. & E. B. Co. 1
Crosby Steam Gage & Valve Co. 12
Crowl, Samuel H. 34
Curr, Robert 34

Dallett, Thos. H. & Co. 28
Davidson, M. T. 9
Dearborn Drug & Chemical Works 30
Dearing Water Tube Boiler Co. 11
Delauney, Belleville & Co. 27
Delaware River Iron S. B. & E. Works 5
Detroit Shipbuilding Co. 1
Detroit Screw Works 11
Dixon, Jos., Crucible Co. 9

Donnelly Salvage & Wrecking Co. 32
Drake & Maytham 34
Drein, Thos. & Son 4
Duluth, South Shore & Atlantic Ry. 39

Egan Co., The 7
Electric Boat Co. 8
Electro-Dynamic Co. 1
Ellis Marine Plumbing Co. 7
Elphicke, C. W. & Co. 34
Elwell-Parker Electric Co. 2
Erie & Western Trans. Co. 32

Falls Hollow Staybolt Co. 4
Farrar & Trefts 5
Fay & Egan Co., J. A. 7
Fletcher, W. & A. Co. 4
Fore River Engine Co. 5
Fogg, M. W. 31

Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated 31
General Electric Co. 12
Gibbs & Joys 34
Giddings & Stevens 31
Gilchrist, Albert J. 34
Goulder, Holding & Masten 34
Graham, James & Co. 33
Great Lakes Register 7

Hall & Root 34
Hanna, M. A. & Co. 32
Hardy, John B. 4
Harlan & Hollingsworth Co., The 5
Hawgood & Moore 34
Helios-Upton Co. 6
Helm, D. T. & Co. 34
Herriman, F. D. 7
Hillman, Gustav 34
Hodge, S. F. & Co. 8
Holmes, Samuel 34
Hoyt, Dustin & Kelley 34
Hungerford Brass & Copper Co., U. T. 3
Hunt, Robert W. & Co. 34
Hutchinson & Co. 34
Hyde Windlass Co. 40

Ingersoll-Sergeant Drill Co. 32
International Anchor Co. 9
International Correspondence Schools 32
International Navigation Co. 7
Iowa Iron Works 5

Jenkins Brothers 10-12
Jenks Ship Building Co. 39

Kahnweiler's Sons, David 4
Katzenstein, L. & Co. 4

*Kenney Co., The 27
Keith, J. G. & Co. 34
Keystone Engine & Machine Works. 6
Kingsford Foundry & Machine Works. 30

Lane & DeGroot 4
*Learmonth, Robert 30
Lebanon Chain Works 5
Lidgerwood Mfg. Co. 6
L. S. & M. S. Ry. 39

McMyler Mfg. Co. 4
*Magnolia Metal Co. 1
MacKinnon Mfg. Co. 8
Mair, John & Son 6
Marine Iron Co. 4
Marine Supply Co. 31
Martin-Barriss Co. 9
Maryland Steel Co. 5
Miller, Walter 9
Mitchell & Co. 34
Moffat & O'Brien 34
Monongahela Iron & Steel Co. 3
*Moran Bros. Co. 39
Morse Iron Works & Dry Dock Co. 4
Morse, Williams & Co. 9
Mott Iron Works, J. L. 10

Neafie & Levy Co. 5
*Newhall Chain Forge & Iron Co. 30
Newport News Ship Building & Dry Dock Co. 5
New Doty Mfg. Co. 12
Niles Tool Works Co. 3
Nixon, Lewis 5
North River Iron Works 5

Olds Motor Works 8
Osborne & Co., F. H. 34

Page Bros. & Co. 3
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Pittsbu gh Testing Laboratory, Ltd. 34
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Powell, Ambrose V 31
Pusey & Jones Co. 5

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Red Star Line 7
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Shelby Steel Tube Co. 29
Sheriffs Mfg. Co. 10
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Wolff & Zwicker Iron Works 5
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*Wood & Co., R. D. 30
Woods Machine Co., S. A. 8
Worthington, Henry R. 9
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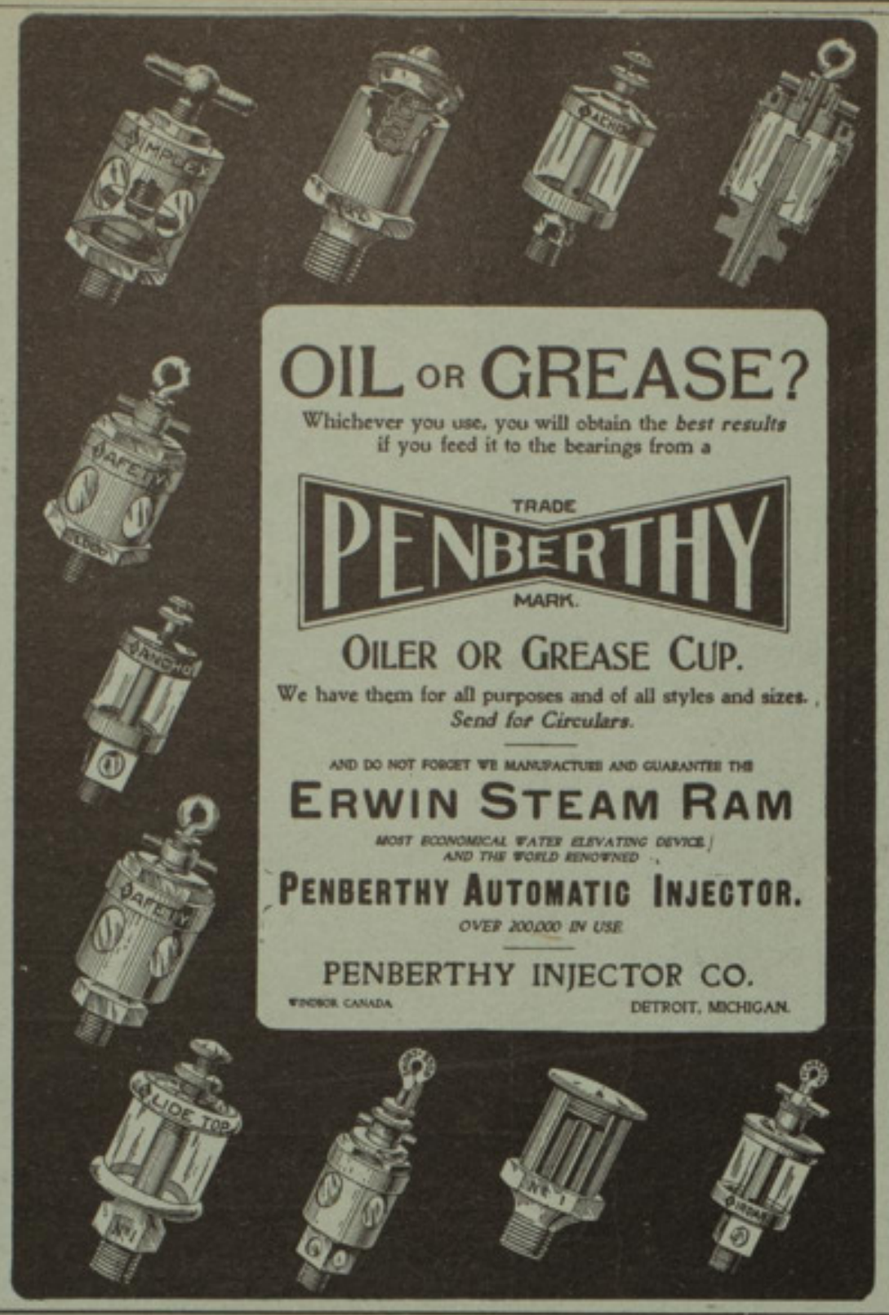

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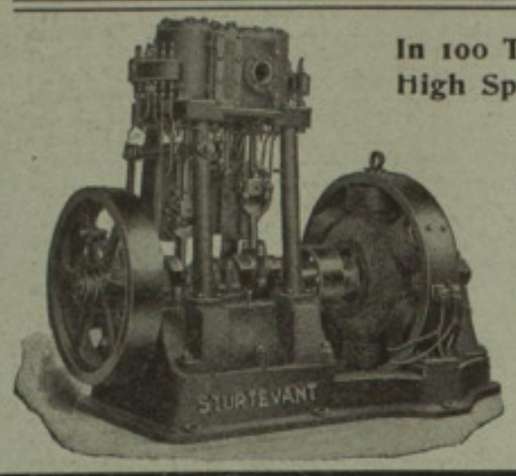

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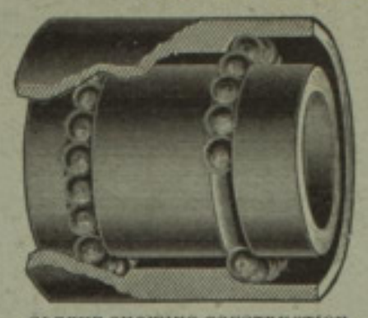

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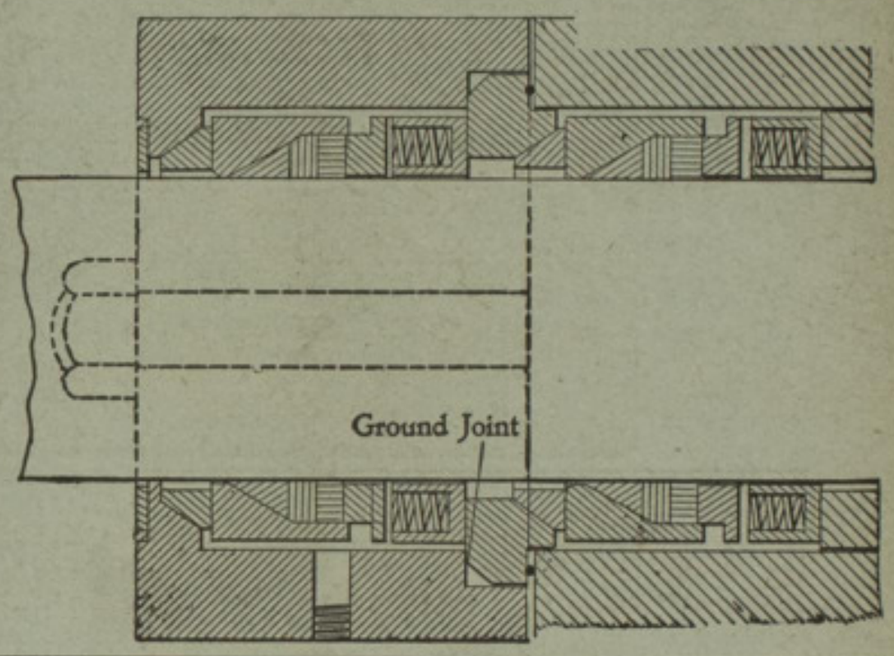

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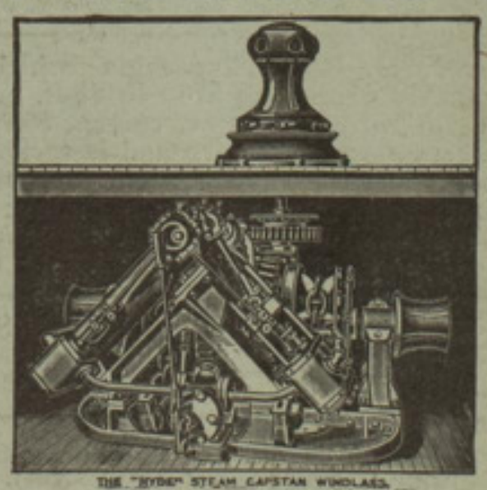

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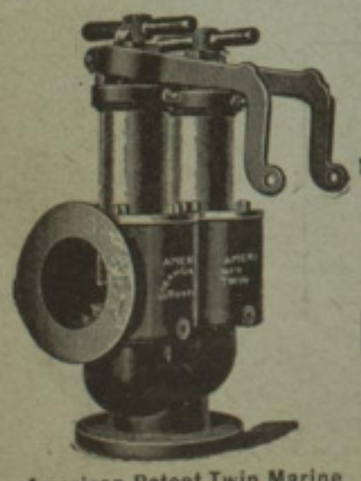

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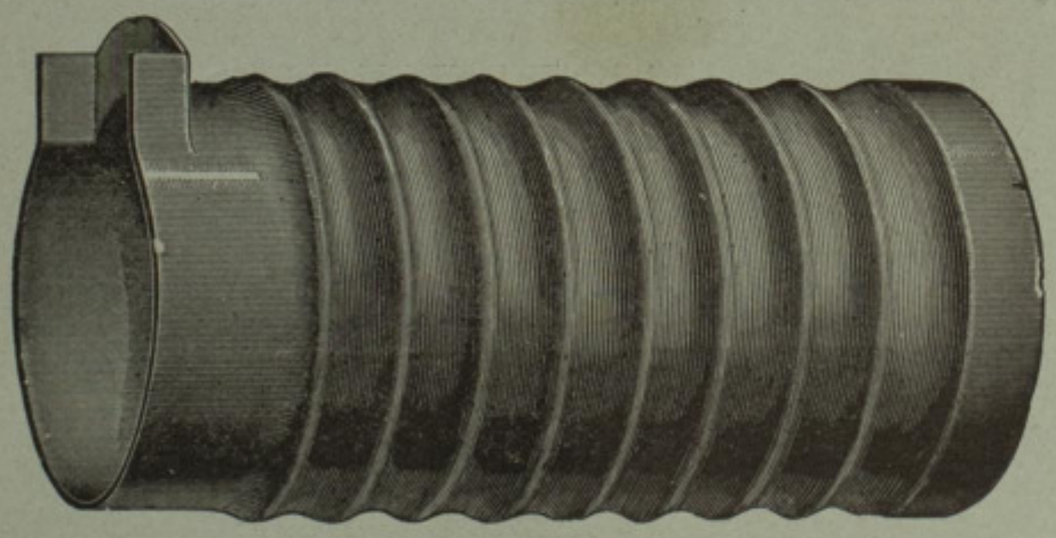

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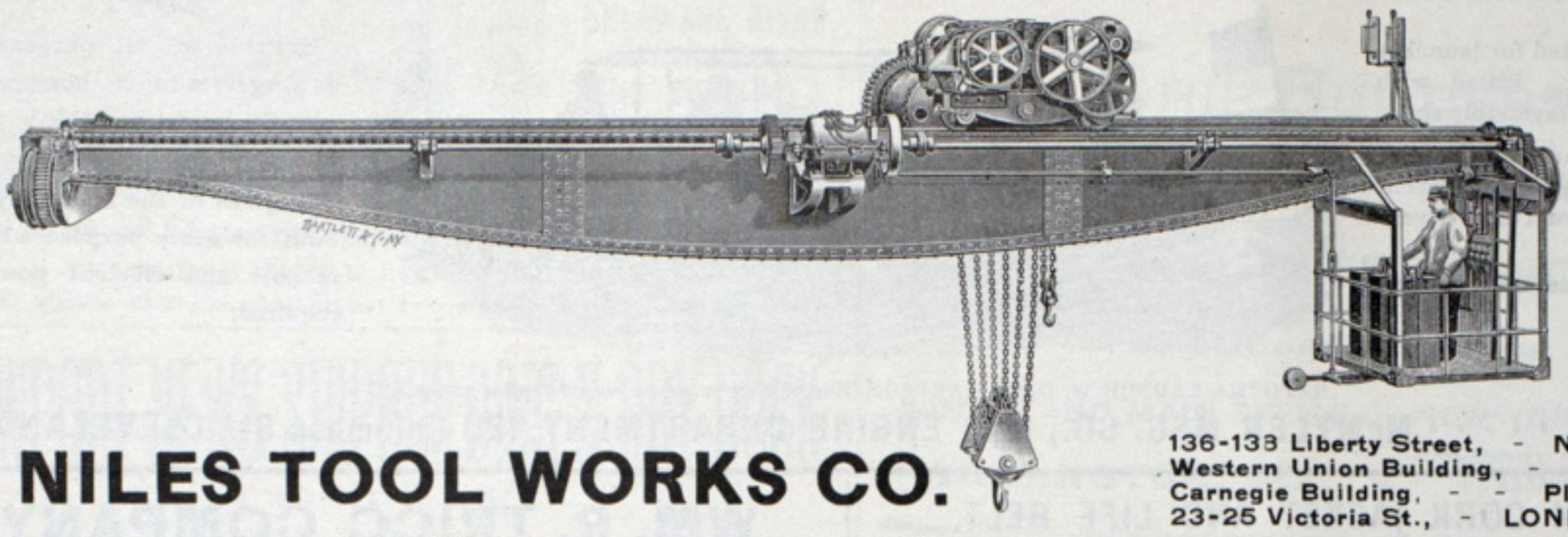

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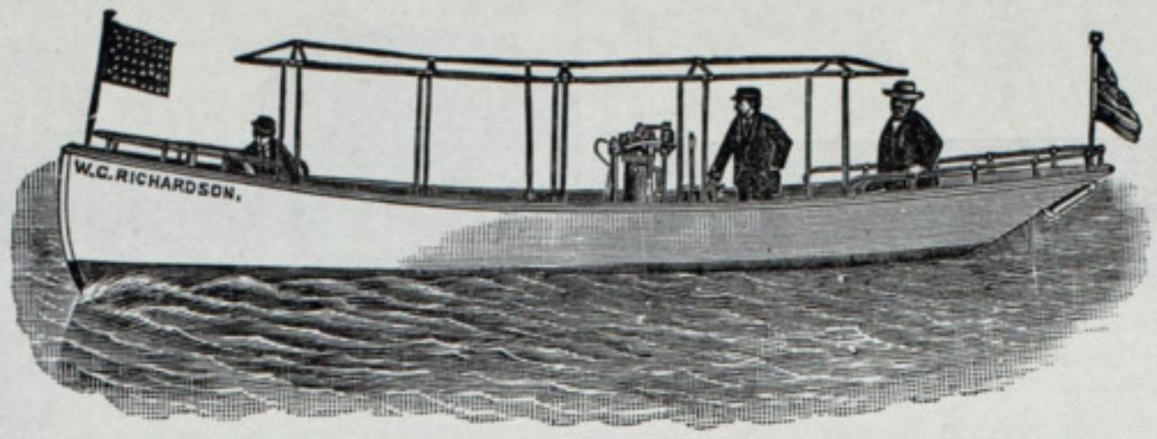

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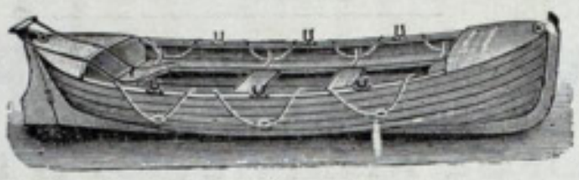

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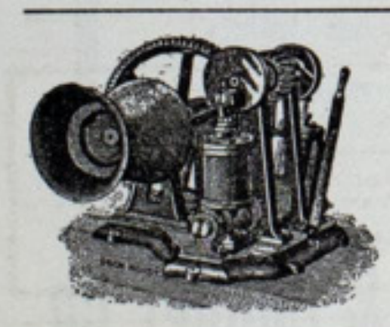

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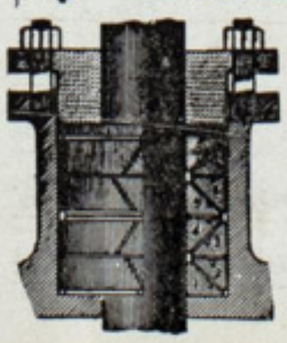

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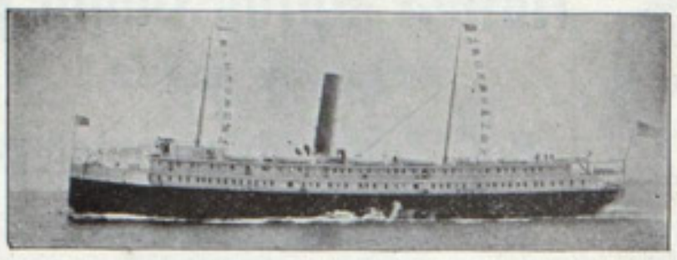

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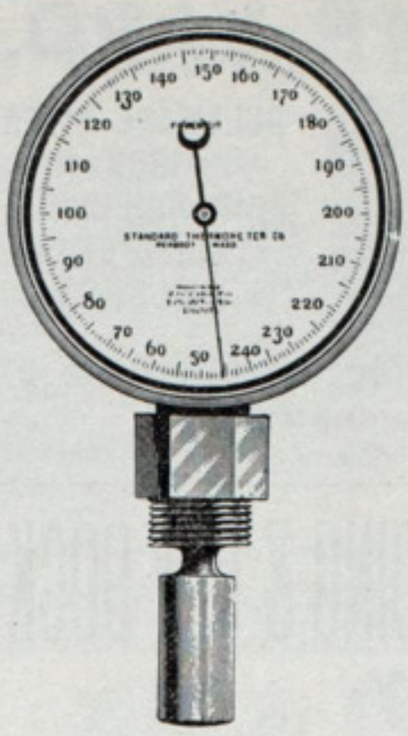

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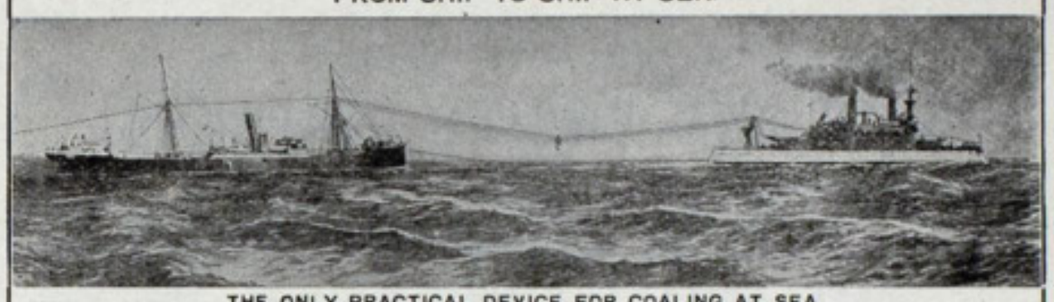

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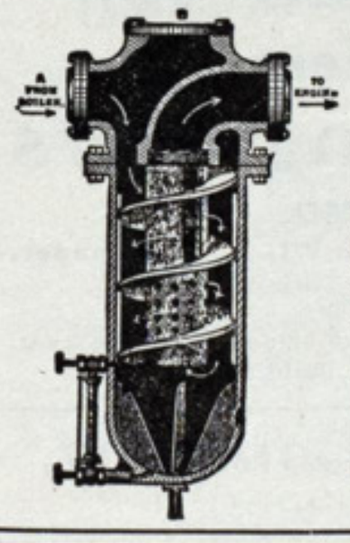

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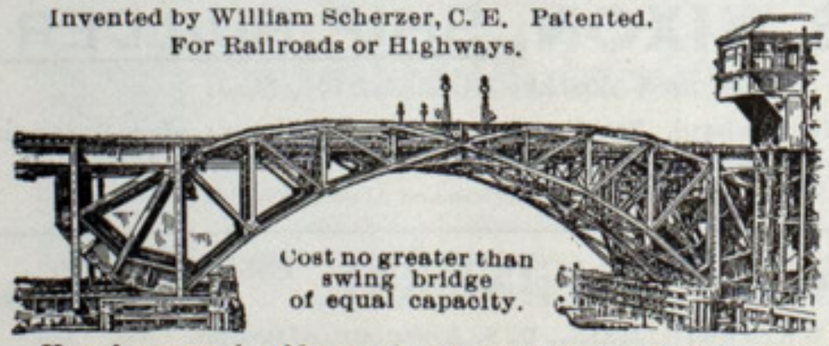

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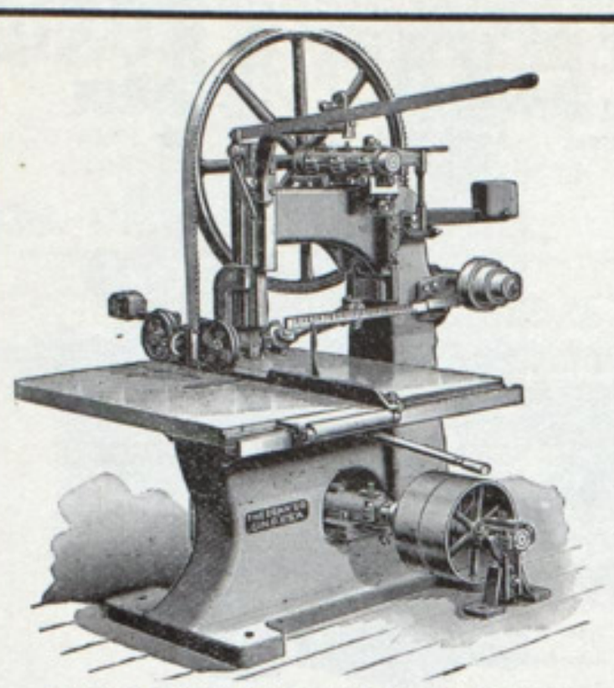

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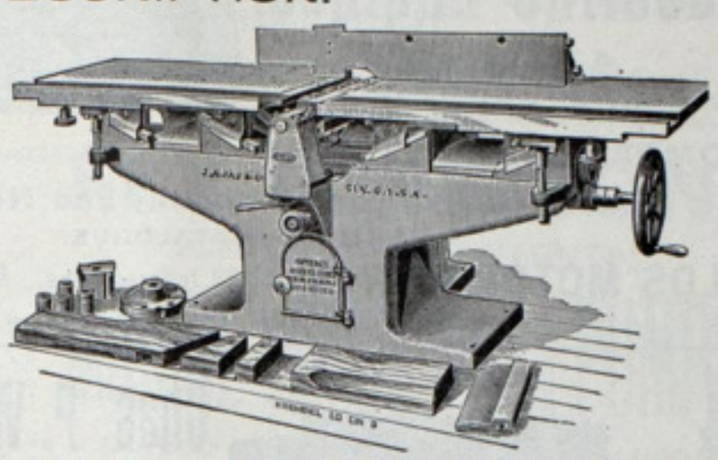

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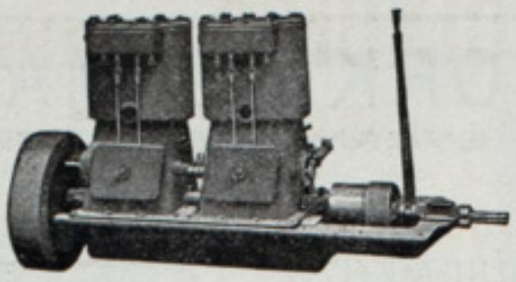

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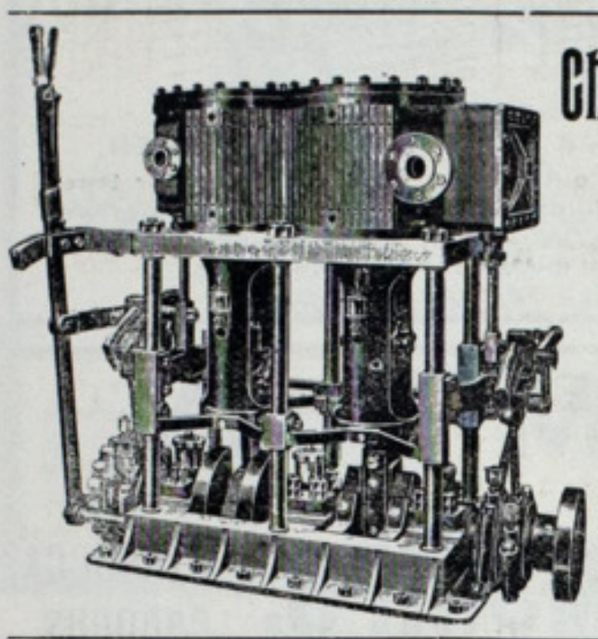

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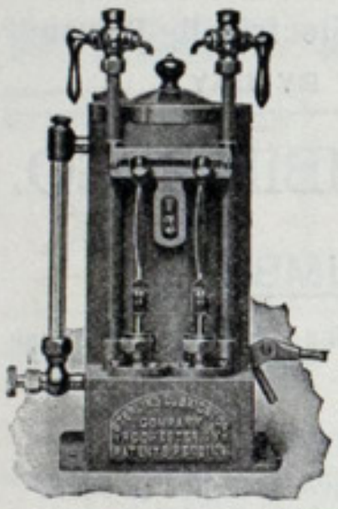

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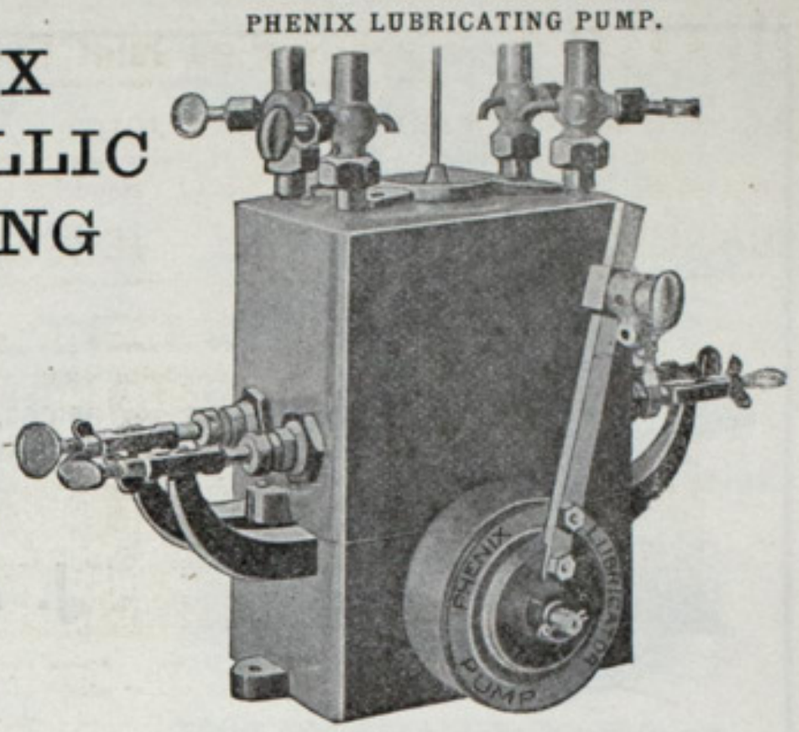

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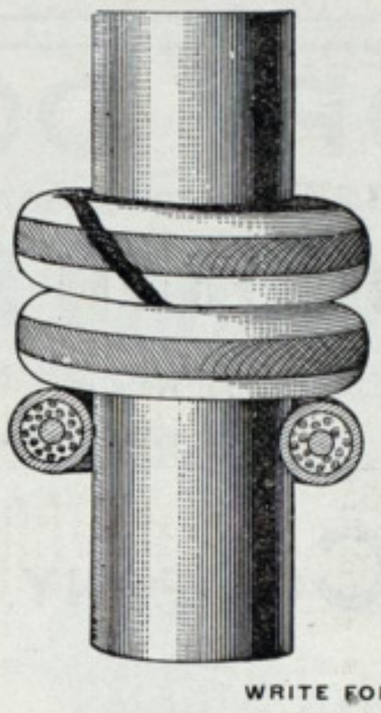

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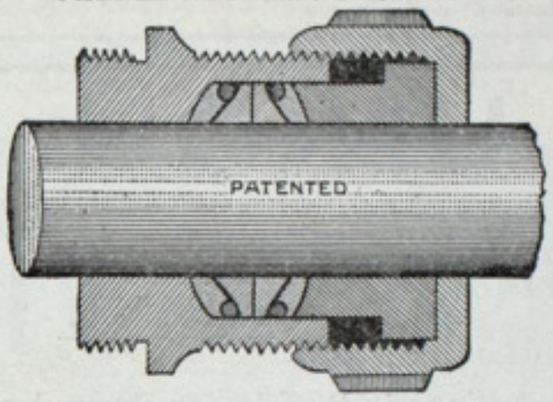

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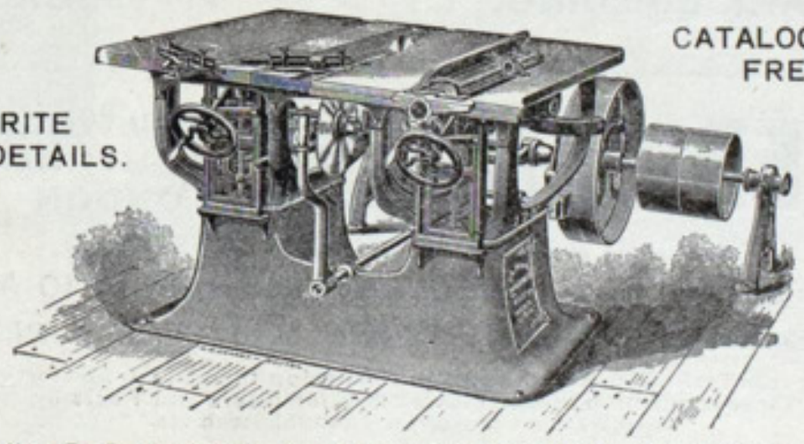

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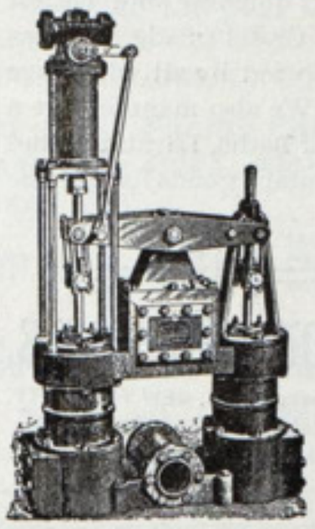

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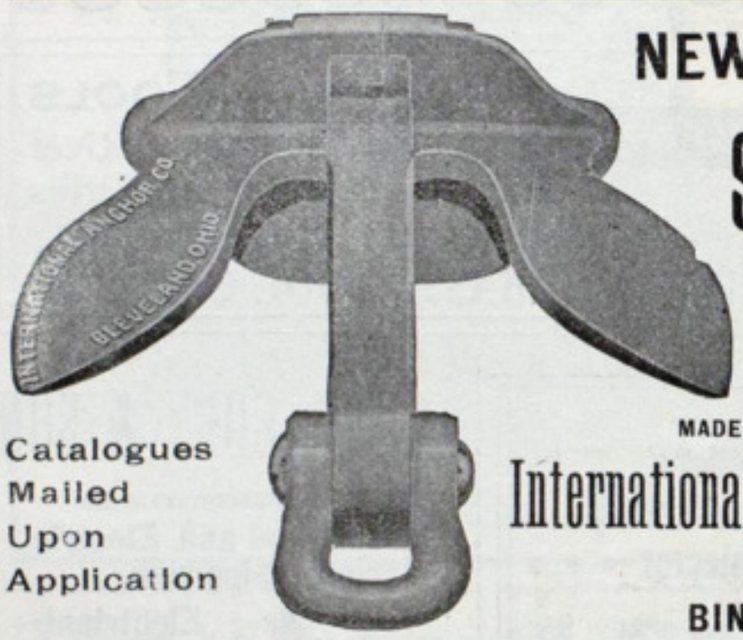

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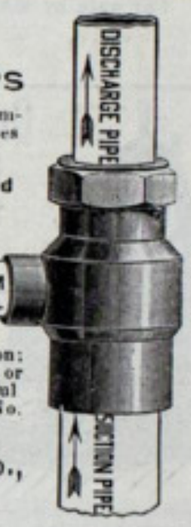

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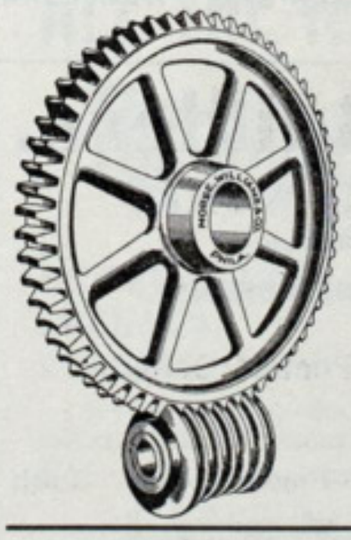

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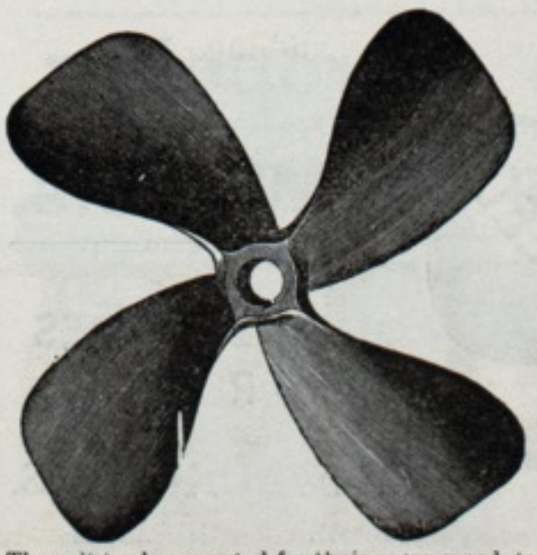

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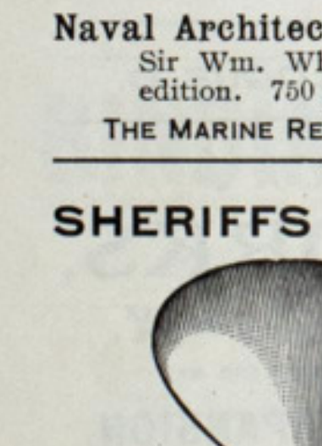

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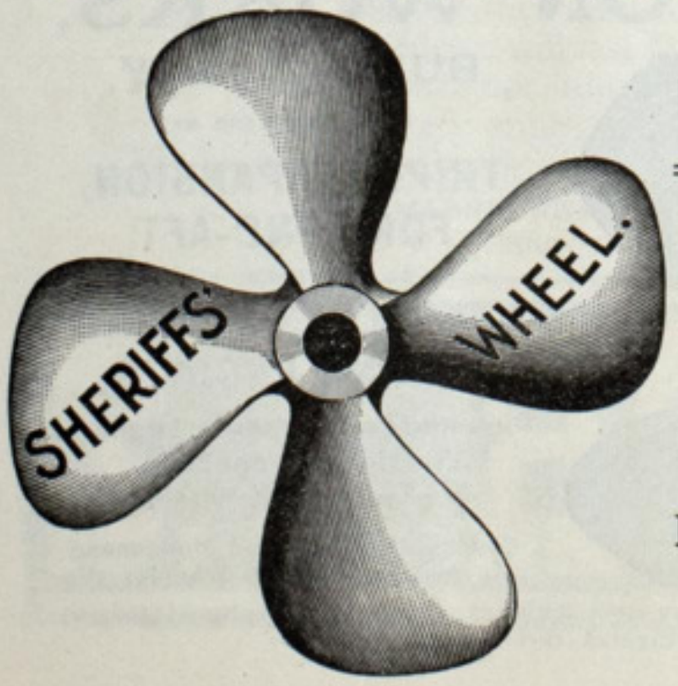

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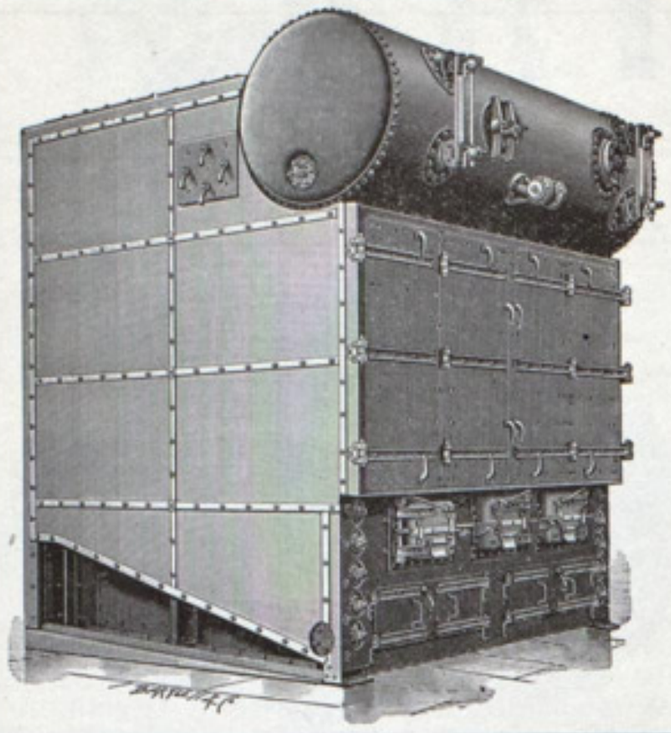

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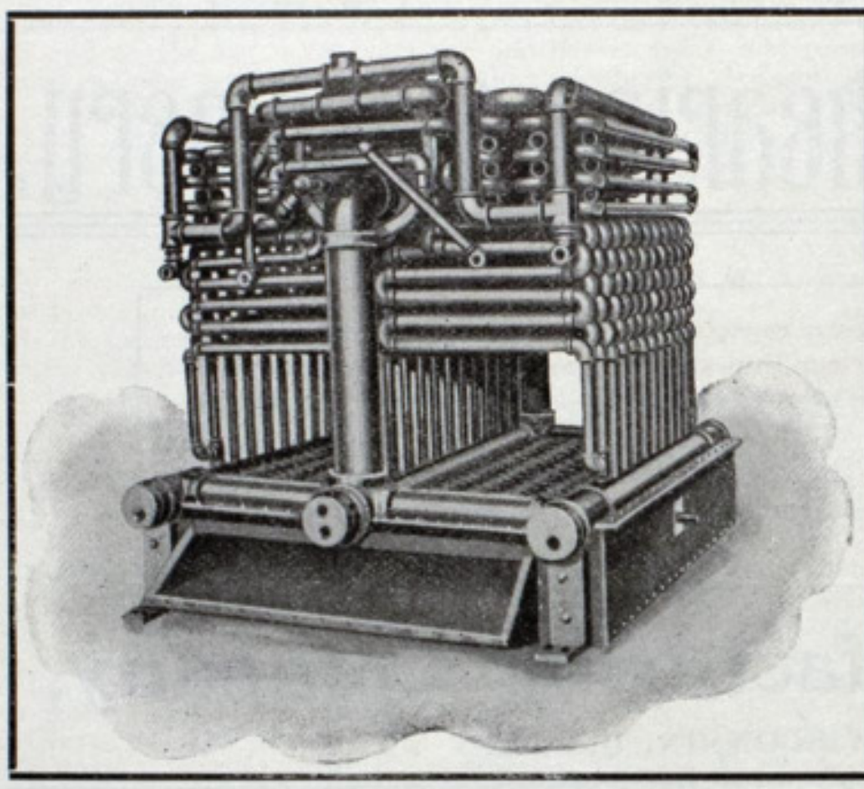

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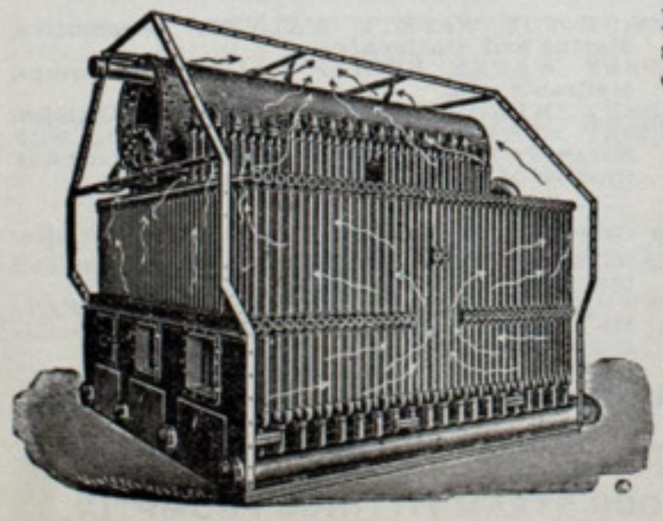

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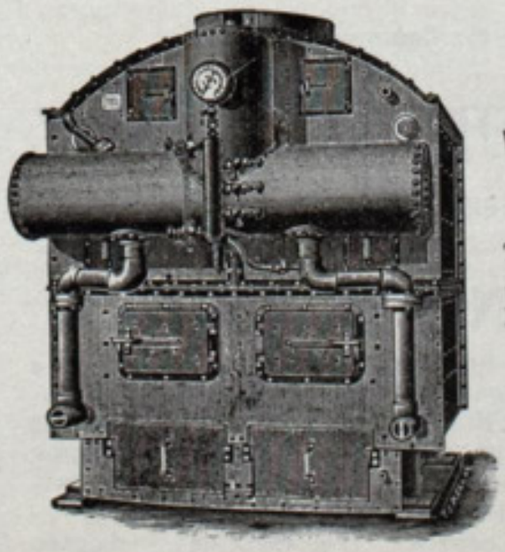

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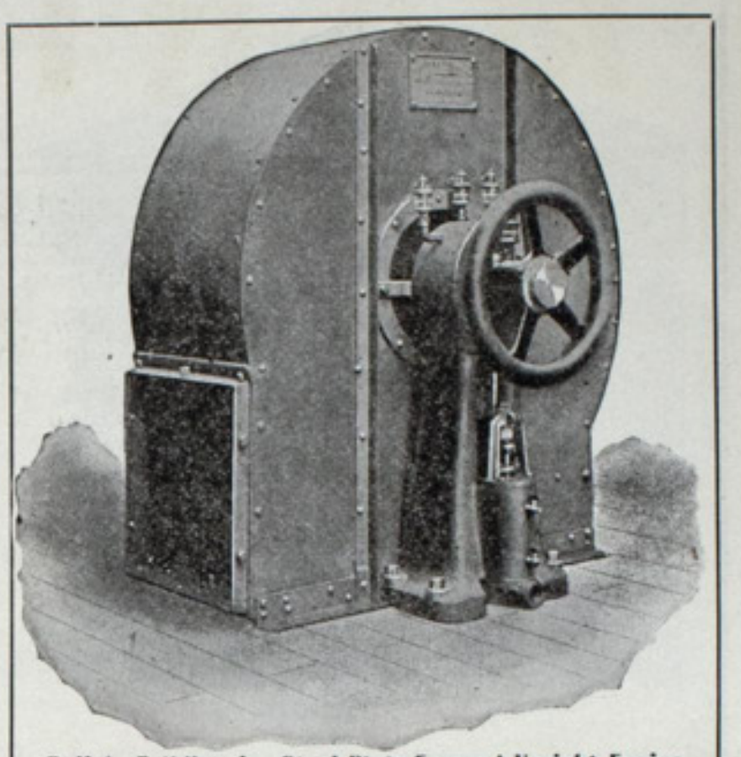

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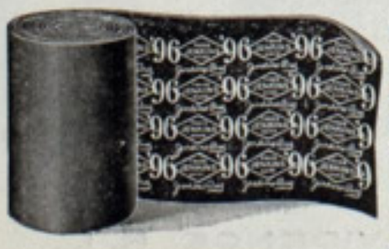

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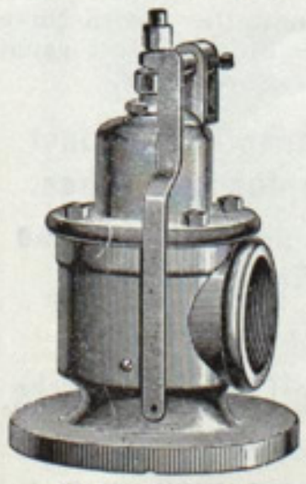

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